

# CHAPTER 4

## *Affected Environment, Environmental Consequences, and Mitigation*

### BACKGROUND INFORMATION

This chapter presents pertinent information regarding the existing social, economic, and environmental setting of the proposed action. It also presents findings relative to the evaluation of potential environmental consequences of three action alternatives in the Western Section, one action alternative in the Eastern Section, and the No-Action Alternative (see Chapter 3, *Alternatives*, for information regarding the alternatives' design features). Where applicable, measures to avoid, reduce, or otherwise mitigate environmental impacts are described.

In accordance with National Environmental Policy Act (NEPA) provisions, substantial discussion is given to those elements of the environment most affected by the proposed action. Other elements of the environment are discussed to a lesser degree in the context of the chapter. Table 4-1 provides a summary of topics, content, and intended benefits to the reader.

#### Can the Impacts Change and, If So, How?

Findings relative to impacts presented in this chapter could change. The reasons for future changes, which would be presented in the record of decision (ROD), are based on, but not limited to:

- refinement in design features through the design process
- updated aerial photography as it relates to growth in the Western Section of the Study Area
- communications with the City of Phoenix, the Gila River Indian Community (Community), and other stakeholders regarding measures to minimize harm to resources of the South Mountains afforded protection under Section 4(f)
- potential permission provided by the Community to develop action alternatives on Community land
- responses to public input
- potential changes to traffic forecasts as updated regularly by the Maricopa Association of Governments (MAG)
- potential changes regarding updated census data
- potential regulatory changes by local, State, or federal agencies

As design would progress, refinements would be made. Cost estimates for construction, right-of-way (R/W)

acquisition, relocation, and mitigation would be updated on a regular basis.

Design enhancements would reduce impacts, enhance cost efficiencies, and/or accommodate other planning activities.

Even with these factors affecting findings, it is anticipated the effects would be roughly equivalent among the alternatives and, consequently, impacts would be comparatively the same. The assumption would be confirmed if and when such changes were to occur.

Consequently, mitigation measures presented in the chapter are considered by the Arizona Department of Transportation (ADOT) and Federal Highway Administration (FHWA) as possible future commitments to be implemented to avoid, reduce, or otherwise mitigate environmental impacts associated with the proposed action. The discussion of these mitigation measures in the Final Environmental Impact Statement (FEIS) does not obligate ADOT to these specific measures. ADOT, along with FHWA, may choose to modify, delete, or add measures to mitigate impacts. If this were to occur, these modifications to the mitigation measures would be explained in detail in the ROD. Final commitment to mitigation measures would be made in the ROD.

Review of technical reports, predecisional reports, and memorandums

Technical reports—with the exception of the cultural resources and Section 4(f) technical reports (because of the sensitive information they contain)—are available on the project Web site at <azdot.gov/southmountainfreeway>. If reviewing a hard copy, the technical reports are also included on the compact disc placed in the envelope on the back cover of Volume I. Technical reports, predecisional reports, and memorandums can be made available for review by appointment at Arizona Department of Transportation (ADOT) Environmental Planning Group, 1611 W. Jackson St., Phoenix, AZ 85007 [(602) 712-7767]. Special requests for portions of the cultural resources and Section 4(f) reports will be considered by ADOT on a case-by-case basis. These reports examine existing conditions and assess potential impacts on existing conditions.

Table 4-1 Affected Environment, Environmental Consequences, and Mitigation Content Summary, Chapter 4

| Topic  | Page  | Highlights   | Reader Benefit   |
|--|-------|--|--|
| Background Information   | 4-1   | <ul style="list-style-type: none"><li>• Discussion of the changing nature of environmental assessments as the proposed action and No-Action alternatives progress through time and through the design process (if an action alternative were to become the Selected Alternative)</li><li>• Reasons the environmental assessment could change over time and implications to the EIS<sup>a</sup> process</li></ul>   | <ul style="list-style-type: none"><li>• Understanding of how assessments of social, economic, and environmental impacts fit into the EIS process</li><li>• Understanding of how mitigation measures do not become full ADOT<sup>b</sup> commitments until issuance of a record of decision</li></ul> |
| Land Use   | 4-3   | <ul style="list-style-type: none"><li>• Description of relevant aspects of the social, economic, and environmental context (“affected environment”) of the three action alternatives in the Western Section, one action alternative in the Eastern Section, and the No-Action Alternative</li><li>• Evaluation of the magnitude and intensity of the various alternatives on the resources of concern (“environmental consequences”)</li><li>• Description and explanation of appropriate measures that would be taken to avoid, reduce, or otherwise lessen the magnitude and intensity of the various alternatives’ impacts (“mitigation measures”)</li><li>• A conclusion at the end of each section explains the relative context, intensity, and magnitude of the impacts on the resources of concern within the overall scope of the EIS analyses. Each conclusion is not intended to restate findings presented in each section but appropriately highlights noteworthy aspects of the information presented.</li></ul> | <ul style="list-style-type: none"><li>• Resource-by-resource understanding of the social, economic, and environmental impacts of the various action and No-Action alternatives</li><li>• Resource-by-resource understanding of proposed mitigation measures</li></ul>                                |
| Social Conditions  | 4-20  |  |  |
| Environmental Justice and Title VI   | 4-29  |  |  |
| Displacements and Relocations  | 4-46  |  |  |
| Economic Impacts   | 4-56  |  |  |
| Air Quality  | 4-68  |  |  |
| Noise  | 4-88  |  |  |
| Water Resources  | 4-101 |  |  |
| Floodplains  | 4-110 |  |  |
| Waters of the United States  | 4-116 |  |  |
| Topography, Geology, and Soils   | 4-121 |  |  |
| Biological Resources   | 4-125 |  |  |
| Cultural Resources   | 4-140 |  |  |
| Prime and Unique Farmlands   | 4-161 |  |  |
| Hazardous Materials  | 4-164 |  |  |
| Visual Resources   | 4-167 |  |  |
| Energy   | 4-172 |  |  |
| Temporary Construction Impacts   | 4-173 |  |  |
| Material Sources and Waste Material  | 4-176 |  |  |
| Irreversible and Irretrievable Commitment of Resources                             | 4-177 |  |  |
| Relationship between Short-term Uses of the Environment and Long-term Productivity | 4-178 |  |  |
| Secondary and Cumulative Impacts   | 4-179 |  |  |
| Conclusions  | 4-190 | <ul style="list-style-type: none"><li>• Action alternatives differentiated by the impacts each would cause</li><li>• Overall chapter conclusions do not summarize data already presented; rather, they highlight noteworthy observations and conclusions drawn from observations of the data.</li></ul>  | <ul style="list-style-type: none"><li>• Integrated summary of the scientific and analytical basis for comparison of the social, economic, and environmental impacts associated with the various alternatives</li></ul>   |

<sup>a</sup> environmental impact statement    <sup>b</sup> Arizona Department of Transportation

LAND USE

This section describes the existing land use, zoning, development plans, future land use plans, and land ownership for the Study Area. Land use planning and transportation planning are intrinsically tied. In the Phoenix metropolitan area, the construction of the proposed action has been accommodated in past planning and is part of affected jurisdictions’ ongoing general planning processes. Typically, the construction of a project like the proposed action follows on the heels of planned residential areas, employment centers, and commercial developments.

AFFECTED ENVIRONMENT

Existing Land Use, Land Use Trends, and Ownership

The entire Study Area falls within Maricopa County. Figures 4-1 and 4-2 illustrate the jurisdictional boundaries and land ownership, respectively. Within the Study Area, each jurisdiction’s planning area may include incorporated areas and unincorporated areas likely to be annexed in the future. These planning areas are regulated by the respective jurisdiction’s general plan, which guides future growth, and by the zoning

ordinance, the principal tool in the implementation of the general plan. The largest land area included in the Study Area is in the Phoenix planning area. Tolleson follows, with the Study Area covering its entire incorporated area.

The Phoenix metropolitan area has historically and nationally been fast-growing, and projected growth in the Study Area and its surroundings is in line with the growth of the region (see the sections, *Need Based on Socioeconomic Factors*, beginning on page 1-11, and *Social Conditions*, beginning on page 4-20, to learn more about the growth rates in population, employment, and housing in the Study Area). Overall population growth in the Phoenix metropolitan area has affected the pattern of land use and infrastructure needs through the growth of residential, commercial, and employment land uses (land used for office, industrial, or retail uses is referred to as employment land uses) and through necessary public services such as provision of police and fire protection. The areas of greatest population growth are anticipated at the fringe of the metropolitan area (for example, the city of Buckeye, the city of Peoria, and the town of Gilbert). Of the Phoenix planning areas within the Study Area, Laveen and Estrella

villages are expected to have population growth rates approximately equal to those of the rapidly expanding communities on the fringes of the metropolitan area, where population is expected to increase as much as 75 percent from 2010 to 2035 (MAG 2013b).

The area is primarily characterized by single-family residential and agricultural land (30 percent and 22 percent of the Study Area, respectively). Approximately 57 percent of the Study Area is developed, with residential (30 percent single-family and 2 percent multifamily), commercial (4 percent), industrial (15 percent), transportation (2 percent), or public/quasi-public land uses (4 percent). The remaining 43 percent of the Study Area consists of agricultural land (22 percent), undeveloped land (10 percent), and open space (11 percent).

Data in Table 4-2 convey that much of the Study Area in 2013 was developed. As conveyed in Figure 4-3, the most intensely developed portion of the Study Area is along Interstate 10 (I-10) (Papago Freeway). Moving south, the Study Area is characterized by less dense development. At the southwestern extent, land uses are predominantly rural agrarian. Southeast of Phoenix South Mountain Park/Preserve (SMPP), adjacent to I-10 (Maricopa

Existing versus planned land use

Vacant and agricultural land is quickly being converted in the Phoenix metropolitan area (the section, *Land Development Plans*, on page 4-17, describes the ongoing development activity contributing to this conversion). Of three major land use types, residential land use was predominant in 2009. As depicted in the table below, large-scale land conversion, supported by existing zoning, will continue.

| Land Use              | Existing (%) | Zoned (%) |
|-----------------------|--------------|-----------|
| Agricultural          | 22           | 12        |
| Residential           | 32           | 49        |
| Commercial/Industrial | 19           | 25        |

Table 4-2 Existing Land Use, by Study Area Jurisdiction

| Land Use                       | Avondale |                | Chandler       |     | Glendale |     | Goodyear |     | Phoenix |     | Tolleson |     | Study Area |     |
|--------------------------------|----------|----------------|----------------|-----|----------|-----|----------|-----|---------|-----|----------|-----|------------|-----|
|                                | Acreage  | % <sup>a</sup> | Acreage        | %   | Acreage  | %   | Acreage  | %   | Acreage | %   | Acreage  | %   | Acreage    | %   |
| Agricultural                   | 1,376    | 39             | — <sup>b</sup> | —   | 138      | 46  | 5        | 3   | 9,922   | 21  | 782      | 21  | 12,223     | 22  |
| Commercial                     | 403      | 11             | 247            | 32  | 17       | 6   | 25       | 13  | 1,400   | 3   | 183      | 5   | 2,275      | 4   |
| Industrial                     | 89       | 3              | 309            | 40  | —        | —   | —        | —   | 6,357   | 13  | 1,744    | 46  | 8,499      | 15  |
| Open Space                     | 301      | 8              | —              | —   | 11       | 4   | —        | —   | 5,974   | 12  | 38       | <1  | 6,324      | 11  |
| Public/Quasi-public            | 55       | 2              | —              | —   | —        | —   | 7        | 4   | 2,018   | 4   | 125      | 3   | 2,205      | 4   |
| Residential (MF <sup>c</sup> ) | 35       | <1             | 20             | 2   | —        | —   | 14       | 7   | 958     | 2   | 34       | <1  | 1,061      | 2   |
| Residential (SF <sup>d</sup> ) | 930      | 26             | —              | —   | —        | —   | —        | —   | 15,396  | 32  | 462      | 12  | 16,788     | 30  |
| Transportation                 | 209      | 6              | 113            | 15  | 94       | 31  | 64       | 33  | 749     | 2   | 148      | 4   | 1,377      | 2   |
| Undeveloped                    | 150      | 4              | 83             | 11  | 41       | 13  | 77       | 40  | 5,274   | 11  | 291      | 8   | 5,916      | 10  |
| Total                          | 3,548    | 100            | 772            | 100 | 301      | 100 | 192      | 100 | 48,048  | 100 | 3,807    | 100 | 56,668     | 100 |

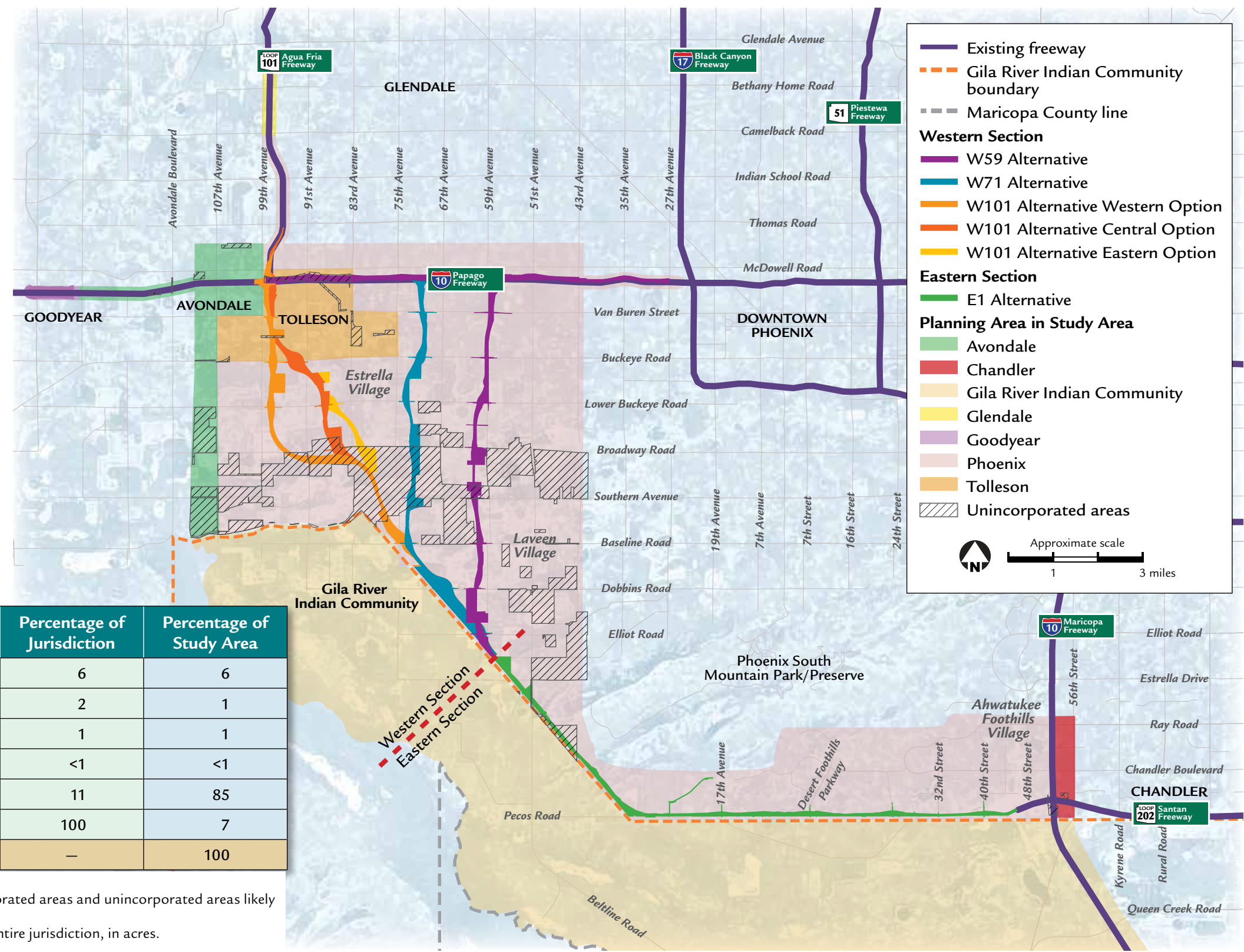
<sup>a</sup> percentage of jurisdiction’s total land use in the Study Area   <sup>b</sup> not applicable   <sup>c</sup> multifamily   <sup>d</sup> single-family

The Gila River Indian Community and impacts

The Community Council has not allowed development of alternatives on Community land (Chapter 2, *Gila River Indian Community Coordination*, provides more information). The Natural Resources Standing Committee granted an extension of a right-of-entry permit in December 2007 for the project team to examine impacts related to construction and operation of the E1 Alternative. Therefore, impacts on the Community from the proposed action as presented in this document are based on data available to the general public and on field observation as appropriate and discussions are limited to only those areas where impacts would occur.



Figure 4-1 Jurisdictions



Land Area, by Study Area Jurisdiction

| Affected Jurisdiction <sup>a</sup> | Acreage in Study Area | Percentage of Jurisdiction | Percentage of Study Area |
|------------------------------------|-----------------------|----------------------------|--------------------------|
| Avondale (60,437)                  | 3,548                 | 6                          | 6                        |
| Chandler (45,697)                  | 772                   | 2                          | 1                        |
| Glendale (58,810)                  | 301                   | 1                          | 1                        |
| Goodyear (96,407)                  | 192                   | <1                         | <1                       |
| Phoenix (423,341)                  | 48,048                | 11                         | 85                       |
| Tolleson (3,809)                   | 3,807                 | 100                        | 7                        |
| Study Area                         | 56,668                | —                          | 100                      |

Note: A jurisdiction's planning area includes incorporated areas and unincorporated areas likely to be annexed in the future.

<sup>a</sup> Number in parentheses is the existing size of the entire jurisdiction, in acres.

The majority of land in the Study Area is located in incorporated municipalities. Some of the unincorporated areas may be subject to annexation.



Freeway), Ahwatukee Foothills Village—located between Community land and SMPP—is nearly built-out with single-family residential, multifamily residential, and commercial land uses.

Notable land use characteristics and trends for each of the affected jurisdictions in the Study Area are:

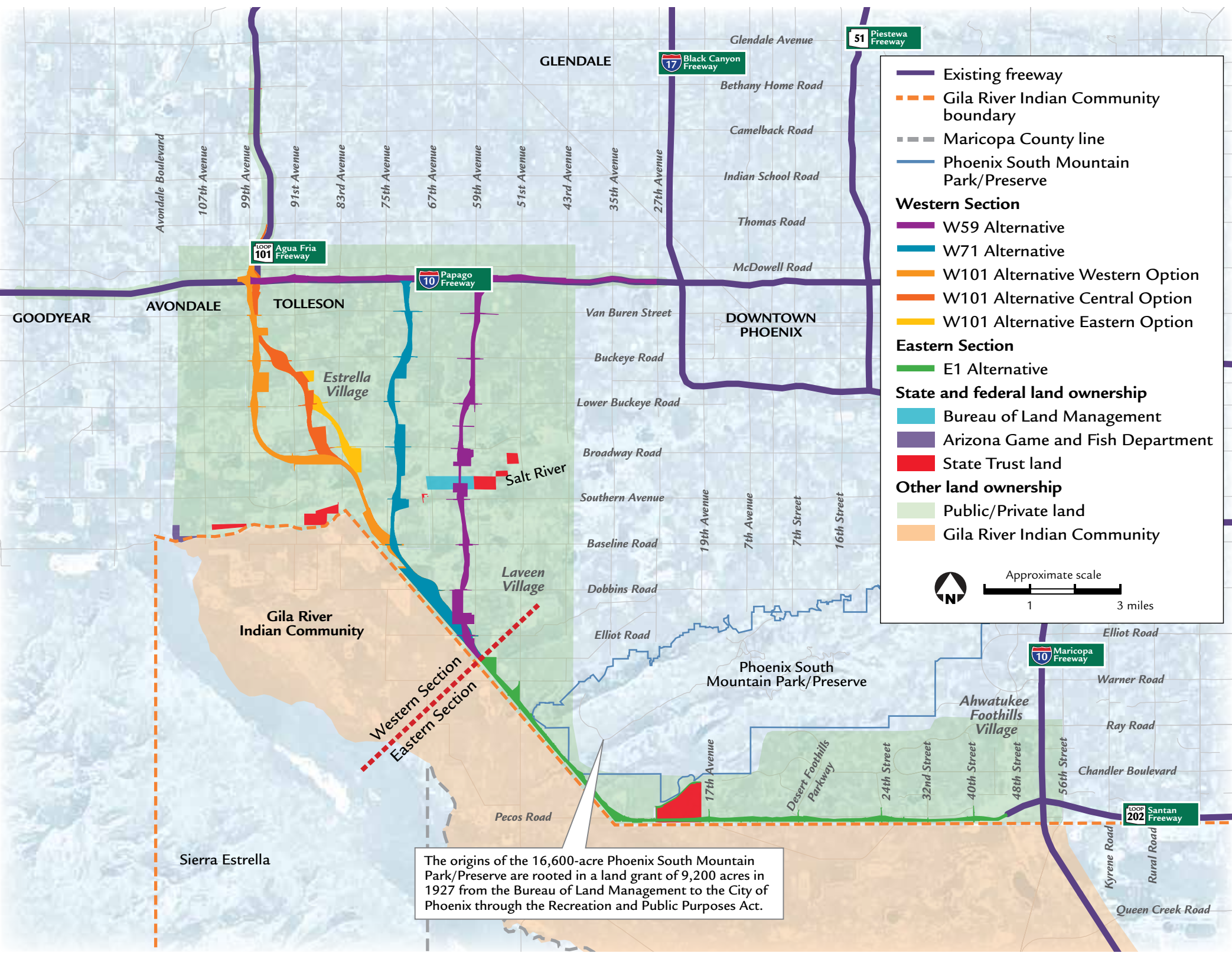
- Avondale’s rapid growth from 1990 to 2010 has influenced the city’s transformation from a rural farming community with a population of just over 16,000 in 1990 to a suburban community with a population of over 76,238 in 2010 (U.S. Census Bureau 2010a). While agricultural remains Avondale’s primary land use in the Study Area, the suburbanization trend will continue.
- Phoenix’s Laveen Village planning area is changing, and residential subdivisions are replacing farmland. Laveen’s existing population of almost 47,500 is expected to nearly double by 2035 (MAG 2013b).



Looking north into Estrella Village from approximately the Salt River and 63rd Avenue

- In Phoenix’s Estrella Village planning area, numerous industrial sites near the Salt River are located east of 91st Avenue. The density of industrial development increases from the Salt River to I-10. Large manufacturing and processing concerns make up the industrial land use between Buckeye Road and I-10. North of I-10, residential is the predominant land use.

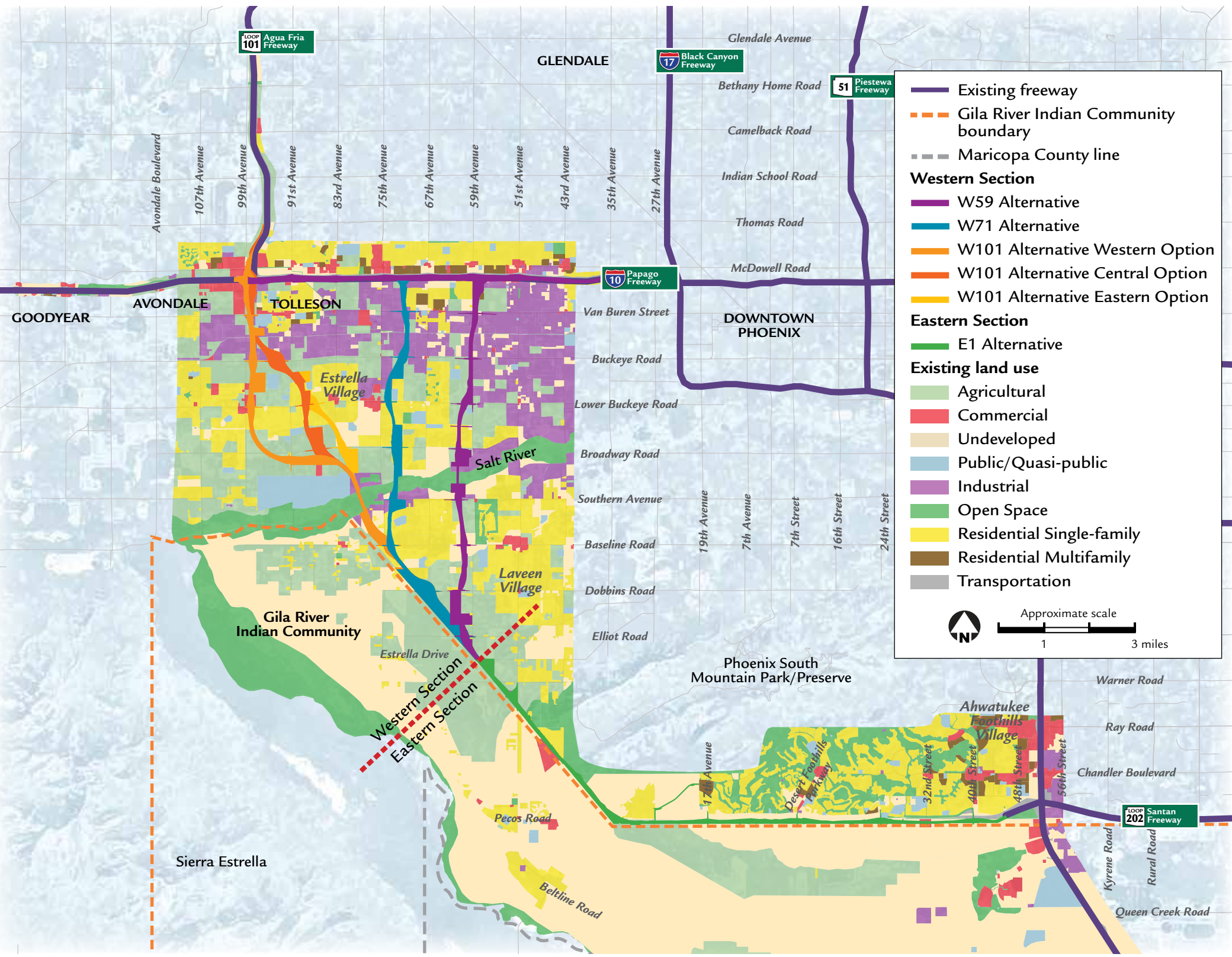
Figure 4-2 Land Ownership



The majority of land outside of the Gila River Indian Community is in private ownership.



Figure 4-3 Existing Land Uses



Looking north at Laveen Village from approximately Dobbins Road and 63rd Avenue

- All 6 square miles of Tolleson lie completely within the Western Section of the Study Area. Originally an agricultural community, approximately 21 percent of its land area remained in agricultural use in 2013. Tolleson's proximity to I-10 and State Route (SR) 101L has made the city a distribution hub for companies delivering products throughout the Southwest—hence the city's large amount of industrial land use (46 percent, or 1,744 acres). The city's residential district is in the center of the city, bounded by the Union Pacific Railroad (UPRR) to the south, I-10 to the north, 99th Avenue to the west, and 83rd Avenue to the east. These geographic and physical boundaries have constrained the city's residential development.
- The Eastern Section of the Study Area encompasses the Ahwatukee Foothills Village planning area.



Looking southwest into Tolleson at approximately Van Buren Street

The agricultural uses once prevalent in the Western Section have been subject to conversion to more urban-based development.





Looking north into Ahwatukee Foothills Village at approximately Pecos Road and 36th Street

The established community is largely built-out with master-planned communities, protected open space areas, and several public schools and parks. Specific impacts to SMPP, a major recreational land use, are presented in Chapter 5, *Section 4(f) Evaluation*.

- Small portions of Chandler, Glendale, and Goodyear are within the Study Area, but effects of the proposed action on these areas would be limited.
- Versions of the proposed action most closely aligned with the W59 and E1 Alternatives have been accounted for in long-range planning by municipalities (most notably, the City of Phoenix). Since the late 1980s, land has been set aside for the alignment. (For example, land along Pecos Road, land through SMPP, and a strip of land through a development north of Broadway Road have been left



The South Mountains as seen from the Estrella Village planning area

undeveloped in anticipation of the freeway project.) However, some development has been allowed to encroach into these areas.

Most of the land potentially affected by the action alternatives is privately owned, with the exception of three parcels (one in the Eastern Section and two in the Western Section) (Table 4-3). Federal, State, and locally owned public land makes up a small portion of the Study Area (Figure 4-2, on page 4-5).

Development Plans

In fall of 2013, information about existing development plans in potentially affected municipalities was gathered. In all, 102 planned developments greater than 25 acres in size were identified in the Study Area, encompassing approximately 15,815 acres (see Figure 4-4). While each of these developments may be in different stages of planning, each is in the process of being approved by a municipality.

Zoning

Arizona Revised Statutes (A.R.S.) § 9-462.01 allows the legislative body of any municipality to institute zoning for the purposes of conserving and promoting the public health, safety, and general welfare. Each of the jurisdictions in the Study Area has enacted zoning ordinances. The zoning ordinance is the principal tool in implementing a community’s adopted general plan and defines the site plan and subdivision requirements for each land use.

To compare the amount and type of zoning, specific municipal zoning categories were grouped into eight broad zoning categories: agricultural, commercial, industrial, open space, planned area development (PAD), public/quasi-public, residential (multifamily), and residential (single-family). Table 4-4 summarizes the zoning for the Study Area, by jurisdiction.

In the Western Section, zoning north of Buckeye Road is largely industrial. South of Buckeye Road, land is zoned either to reflect the existing rural character of the landscape

Table 4-3 State and Federal Land Ownership, Study Area

| Owner <sup>a</sup>               | Acreage |
|----------------------------------|---------|
| Bureau of Land Management        | 192     |
| Arizona Game and Fish Department | 57      |
| Arizona State Land Department    | 781     |

Source: Arizona Land Resource Information System, 2009

<sup>a</sup> Each acreage amount listed in this table amounts to less than 1 percent of the Study Area.

Table 4-4 Zoning, by Study Area Jurisdiction

| Zoning                         | Avondale |                | Chandler       |     | Glendale |     | Goodyear |     | Maricopa County |     | Phoenix |     | Tolleson |     | Study Area |     |
|--------------------------------|----------|----------------|----------------|-----|----------|-----|----------|-----|-----------------|-----|---------|-----|----------|-----|------------|-----|
|                                | Acreage  | % <sup>a</sup> | Acreage        | %   | Acreage  | %   | Acreage  | %   | Acreage         | %   | Acreage | %   | Acreage  | %   | Acreage    | %   |
| Agricultural                   | 76       | 3              | — <sup>b</sup> | —   | —        | —   | 116      | 60  | 45              | 1   | 6,366   | 16  | 31       | 1   | 6,634      | 12  |
| Commercial                     | 55       | 2              | 5              | 1   | 16       | 6   | 10       | 5   | 21              | 0   | 3,193   | 8   | 547      | 14  | 3,847      | 7   |
| Industrial                     | 21       | 1              | 322            | 50  | 260      | 91  | —        | —   | 571             | 7   | 6,638   | 17  | 2,332    | 61  | 10,144     | 18  |
| Unzoned                        | —        | —              | —              | —   | —        | —   | —        | —   | 753             | 9   | 178     | 0   | 252      | 7   | 1,183      | 2   |
| Open space                     | —        | —              | —              | —   | —        | —   | —        | —   | —               | —   | —       | —   | —        | —   | —          | —   |
| PAD <sup>c</sup>               | 2,060    | 84             | 316            | 49  | 8        | 3   | 47       | 24  | —               | —   | 3,769   | 9   | —        | —   | 6,200      | 11  |
| Public/Quasi-public            | —        | —              | 1              | —   | —        | —   | —        | —   | —               | —   | 173     | 1   | 116      | 3   | 290        | 1   |
| Residential (MF <sup>d</sup> ) | —        | —              | —              | —   | —        | —   | 21       | 11  | —               | —   | 2,975   | 7   | 29       | 1   | 3,025      | 5   |
| Residential (SF <sup>e</sup> ) | 248      | 10             | —              | —   | —        | —   | —        | —   | 6,689           | 83  | 17,048  | 42  | 505      | 13  | 24,490     | 44  |
| Total                          | 2,460    | 100            | 644            | 100 | 284      | 100 | 194      | 100 | 8,079           | 100 | 40,340  | 100 | 3,812    | 100 | 55,813     | 100 |

Sources: Cities of Avondale, Chandler, Glendale, Goodyear, Phoenix, and Tolleson, and Maricopa County (see Table 4-5, on page 4-9)

Note: Transportation right-of-way and other areas may not be zoned, so acreages do not equal jurisdiction’s area. Information was current as of November 2013.

<sup>a</sup> percentage of total zoned acreage   <sup>b</sup> not applicable   <sup>c</sup> planned area development   <sup>d</sup> multifamily   <sup>e</sup> single-family



**Legend:**

- Existing freeway
- Gila River Indian Community boundary
- Maricopa County line
- Village planning boundary

**Western Section**

- W59 Alternative
- W71 Alternative
- W101 Alternative Western Option
- W101 Alternative Central Option
- W101 Alternative Eastern Option

**Eastern Section**

- E1 Alternative

**Development type**

- Commercial
- Industrial
- Mixed-use
- Public facility
- Residential

**Map Labels:** GLENDALE, GOODYEAR, AVONDALE, TOLLESON, DOWNTOWN PHOENIX, CHANDLER, Sierra Estrella, Gila River Indian Community, Phoenix South Mountain Park/Preserve, Ahwatukee Foothills Village, Desert Foothills Parkway, Estrella Village, Laveen Village, Salt River, Glendale Avenue, Bethany Home Road, Camelback Road, Indian School Road, Thomas Road, McDowell Road, Van Buren Street, Buckeye Road, Lower Buckeye Road, Broadway Road, Southern Avenue, Baseline Road, Dobbins Road, Elliot Road, Warner Road, Ray Road, Chandler Boulevard, Rural Road, Queen Creek Road, Pecos Road, 17th Avenue, 32nd Street, 40th Street, 48th Street, 56th Street, 19th Avenue, 7th Avenue, 7th Street, 16th Street, 24th Street, 99th Avenue, 91st Avenue, 83rd Avenue, 75th Avenue, 67th Avenue, 59th Avenue, 51st Avenue, 43rd Avenue, 35th Avenue, 27th Avenue, 107th Avenue, Avondale Boulevard, Loop 101 Agua Fria Freeway, Loop 102 Santan Freeway, Loop 10 Maricopa Freeway, Loop 51 Piestewa Freeway, Loop 17 Black Canyon Freeway.

**Scale:** Approximate scale 1 3 miles

**Orientation:** North arrow pointing up.

*The southwestern portion of the Phoenix metropolitan area is projected to be one of the fastest-growing areas in the state. This figure shows areas with a record of planned development by September 2013 (not areas that were already developed or had no record of a planned development by September 2013). Land in the area is typically zoned to reflect the existing rural character of the landscape or is zoned for suburban residential development in advance of anticipated development.*

(Rural-43, Maricopa County’s zoning designation for rural residential, with densities no greater than one dwelling unit per acre; S-1, Phoenix’s Ranch or Farm Residence District, with low-density farm or residential uses to protect and preserve low-density areas in their present character) or is zoned for suburban residential development in advance of anticipated development.

Zoning in the Eastern Section west and north of SMPP is largely low-density residential (approximately one dwelling unit per acre), reflecting the rural agricultural character of this area. In Phoenix’s Ahwatukee Foothills Village planning area to the east, the zoning is primarily higher-density single-family and multifamily residential and planned community district (PCD, the City of Phoenix’s zoning designation that allows flexibility for planning large areas and is typically used for master-planned communities completed over several years’ time). The Chandler portion of the Study Area is zoned industrial and commercial.

Land Use Plans

A general plan is an expression of long-term community intentions regarding a community’s future development and physical form. A general plan commonly contains a community vision and the process necessary to make it a reality. This process is represented by maps, goals, objectives, and policies used to coordinate and implement land use decisions. In addition to transportation infrastructure, policies, impacts, and plans, other areas of the general plan address such issues as infrastructure, parks, recreation and open space, city services, housing supply and affordability, commercial and industrial locations, and public resources such as air and water. The general plan addresses each jurisdiction’s planning area, which includes incorporated areas as well as unincorporated areas likely to be annexed in the future.

All of the affected municipalities in the Study Area have developed comprehensive plans or general plans in accordance with A.R.S. § 9-461.05. This statute calls for the creation and implementation of a general plan for each municipality in Arizona. The plans are implemented through zoning ordinances and other policies. The general and comprehensive plans assist

officials and residents alike in land development issues. General and comprehensive plans are required to include maps of planned land use and circulation systems. Table 4-5 summarizes the status of general plans for all of the affected jurisdictions.

The jurisdictions with authority for land use designations in the Study Area have used approximately 50 general plan land use categories. To better understand the regional distribution of densities and intensities of land uses for the affected jurisdictions, the land use categories for each municipality have been grouped into eight broad land uses: transportation, commercial, industrial, mixed use, open space, public/quasi-public, single-family residential, and multifamily residential. Figure 4-5 shows the distribution of these land uses based on municipalities’ general plans.

ENVIRONMENTAL CONSEQUENCES

This section discusses the environmental consequences of the action alternatives and No-Action Alternative by analyzing 1) the conversion of existing land uses to the proposed action and 2) the compatibility of adjacent land uses with the proposed action. Other impacts relating to land use include displacements and relocations of residential, commercial, and industrial uses; community character and cohesion impacts; visual impacts; impacts on noise levels; and air quality impacts (see the appropriate sections in Chapter 4 for detailed discussions regarding these impacts).

Land Use Conversion

The conversion of land uses resulting from the action alternatives was determined by measuring the number, type, and acreage of existing land uses within the proposed R/W. Land use conversion would occur in the cities of Avondale, Phoenix, and Tolleson. Detailed results are presented in Table 4-6 and summarized in Table 4-7 (no direct land use conversions would occur in the cities of Chandler, Glendale, or Goodyear).

The conversion acreages presented should not be considered final. Design of each action alternative, while completed to an equivalent level, is still preliminary and subject to change as designs would be further

Table 4-5 Status of Affected Jurisdictions’ General Plans and Plan Updates

| Jurisdiction    | Existing Adopted Plan (Adoption Date)                         | Update Status                           |
|-----------------|---|---|
| Avondale        | Avondale General Plan 2030 (2012)                             | Ratified by voters on August 28, 2012   |
| Chandler        | Chandler General Plan (2008)                                  | Ratified by voters on November 14, 2008 |
| Glendale        | General Plan 2025: The Next Step (2002)                       | Ratified by voters on November 5, 2002  |
| Goodyear        | Goodyear General Plan 2003–2013 (2003)                        | Ratified by voters on November 4, 2003  |
| Maricopa County | Eye to the Future – Maricopa County Comprehensive Plan (1997) | Updated to conform with State law       |
| Phoenix         | Phoenix General Plan (2001)                                   | Ratified by voters on March 12, 2002    |
| Tolleson        | Tolleson General Plan (2005)                                  | Ratified by voters on December 13, 2005 |

refined. This process would continue after the ROD into the final design phases for the Selected Alternative, assuming the Selected Alternative were an action alternative. Conversion of land under the No-Action Alternative would occur as land set aside for the proposed action were released from ADOT ownership and as land zoned by local jurisdictions to protect it as a transportation use were rezoned. Additionally, because much of the Western Section of the Study Area continues to be converted from primarily agricultural use to residential suburban uses, these acreages and associated percentages are subject to slight changes.

Action Alternatives, Western Section

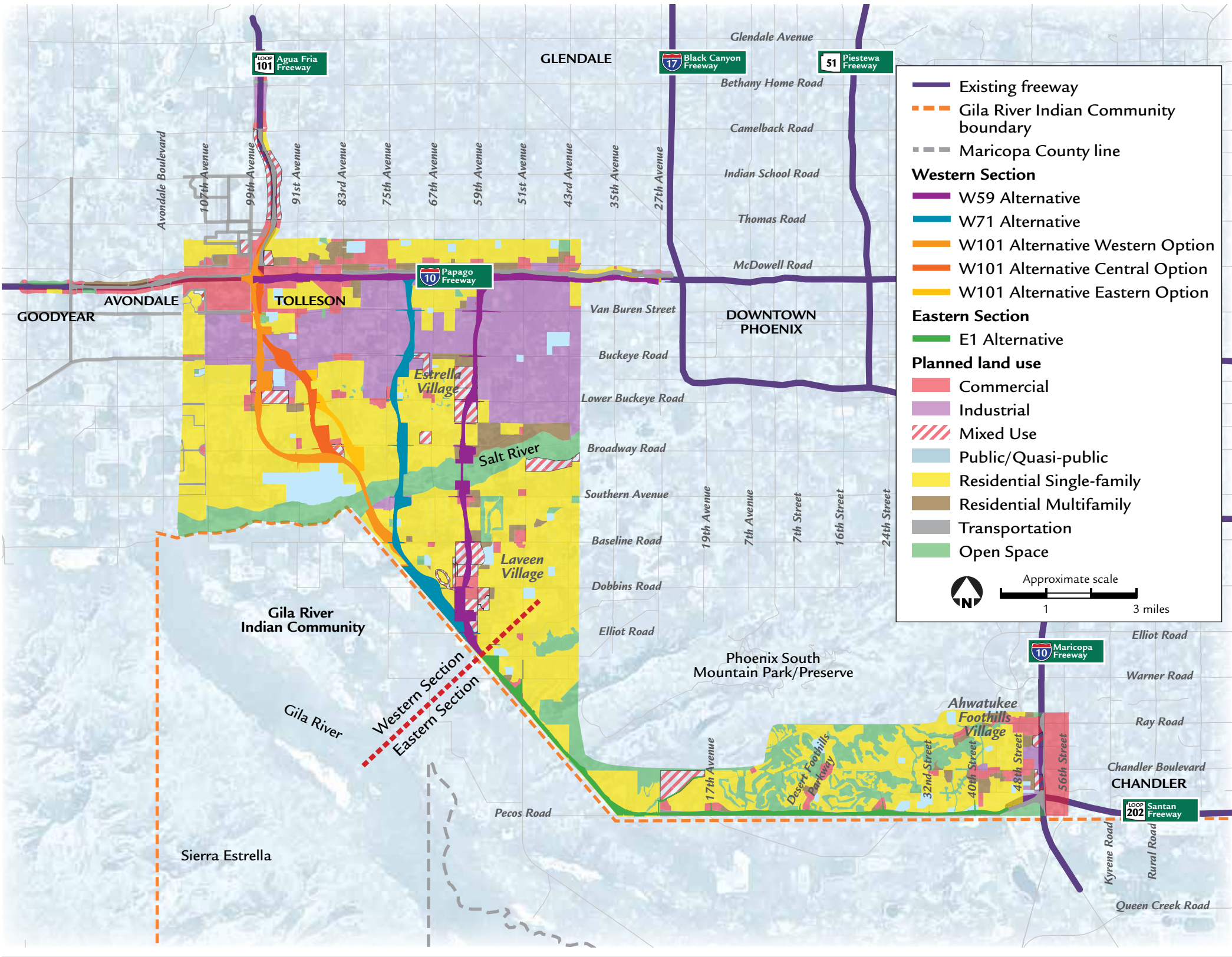
All of the W101 Alternative Options would convert the most land because they are longer alignments than the W59 (Preferred) and W71 Alternatives. Action alternatives contributing to the largest amount of land conversion would be those—such as the W101 Alternative—having the greatest amount of land in agricultural use in 2013. As previously noted, much of this land is undergoing rapid conversion to residential and commercial uses as planned by the local municipalities. The W71 Alternative would convert the greatest amount of industrial land. The W59 and W101 Alternatives would involve a lesser impact on industrial land.

Action Alternative, Eastern Section

Of the land uses in the Eastern Section, agricultural and undeveloped land would be subject to the most



Figure 4-5 General Plan Land Use Designations



Growth trends in the southwestern portion of the Phoenix metropolitan area are supported by general plan land use designations.

conversion. This is primarily a function of the E1 (Preferred) Alternative being located along the Pecos Road alignment and through SMPP, where previous versions of the proposed action have been accommodated in long-range planning by local municipalities [most notably, the City of Phoenix; see Chapter 5, *Section 4(f) Evaluation*, regarding the Phoenix Mountain Preserve Act]. Efforts were made to preserve the corridor by preventing development from occurring. Residential and public/quasi-public land uses have, however, encroached onto the corridor originally intended to be preserved for a future freeway (see text box on pages 4-12 and 4-13 regarding freeway awareness and related topics).

### No-Action Alternative

The No-Action Alternative is assumed to include *Regional Transportation Plan* (RTP)-related improvements (e.g., arterial street widening, SR 30, Avenida Rio Salado [ARS]) and normal maintenance and minor improvements to the transportation system. No major project-related influences on land use in the Study Area would occur and no land would be acquired for R/W purposes. Existing residential land use patterns and trends would be maintained. Other existing trends and economic forces may, however, exert some influence for change. Freeway conditions in 2035 would be substantially worse than the limited areas of stop-and-go driving experienced in 2012. The existing freeways and arterial streets will not operate efficiently with the population, housing, and employment increases forecast for 2035. Combined, these increases will translate into higher demand for use of the existing freeway and arterial street systems. This increase in demand correlates to a need for 33 additional lanes of arterial street capacity in the Study Area. Without the proposed action, the region will suffer even greater congestion, travel delays, and limited options for moving people and goods safely through the Phoenix metropolitan area (see the section, *Historical Context of the Proposed Action*, beginning on page 1-5). Implications of identification of the No-Action Alternative as the Selected Alternative related to the system linkage with the proposed SR 30 and ARS projects are discussed on page 3-35. The No-Action Alternative would not preclude future attempts to construct a project similar to the proposed action at some future time.



Table 4-6 Existing Land Uses within Proposed Right-of-way, Action Alternatives

| Land Use                       | Total Acreage<br>in Study Area | Alternatives    |         |                        |                        |                        |                 |
|--------------------------------|--------------------------------|-----------------|---------|------------------------|------------------------|------------------------|-----------------|
|                                |                                | Western Section |         |                        |                        |                        | Eastern Section |
|                                |                                | W59             | W71     | W101<br>Western Option | W101<br>Central Option | W101<br>Eastern Option | E1              |
|                                |                                | Acreage         | Acreage | Acreage                | Acreage                | Acreage                | Acreage         |
| Avondale                       |                                |                 |         |                        |                        |                        |                 |
| Agricultural                   | 1,376                          | — <sup>a</sup>  | —       | —                      | —                      | —                      | —               |
| Commercial                     | 403                            | —               | —       | 0–5                    | 0–5                    | 0–5                    | —               |
| Industrial                     | 89                             | —               | —       | —                      | —                      | —                      | —               |
| Open space                     | 301                            | —               | —       | —                      | —                      | —                      | —               |
| Public/Quasi-public            | 55                             | —               | —       | —                      | —                      | —                      | —               |
| Residential (MF <sup>b</sup> ) | 35                             | —               | —       | —                      | —                      | —                      | —               |
| Residential (SF <sup>c</sup> ) | 930                            | —               | —       | —                      | —                      | —                      | —               |
| Transportation                 | 209                            | —               | —       | 0–9                    | 0–9                    | 0–9                    | —               |
| Undeveloped                    | 150                            | —               | —       | —                      | —                      | —                      | —               |
| Avondale subtotal              | 3,548                          | —               | —       | 0–14                   | 0–14                   | 0–14                   | —               |
| Phoenix                        |                                |                 |         |                        |                        |                        |                 |
| Agricultural                   | 9,922                          | 546             | 488     | 753–755                | 667–669                | 617–619                | 162             |
| Commercial                     | 1,400                          | 8               | —       | 23–26                  | 1–4                    | 1–4                    | 1               |
| Industrial                     | 6,357                          | 158             | 209     | 43                     | 43                     | 43                     | 10              |
| Open space                     | 5,974                          | 40              | 22      | 22                     | 22                     | 22                     | 112             |
| Public/Quasi-public            | 2,018                          | 1               | 5       | 3                      | 3                      | 3                      | 12              |
| Residential (MF)               | 958                            | 20              | —       | —                      | —                      | —                      | —               |
| Residential (SF)               | 15,396                         | 44              | 295     | 209–224                | 228                    | 247                    | 100             |
| Transportation                 | 749                            | 1               | 1       | 1–7                    | 1–7                    | 1–7                    | 38              |
| Undeveloped                    | 5,274                          | 118             | 41      | 54                     | 55                     | 101                    | 442             |
| Phoenix subtotal               | 48,048                         | 936             | 1,061   | 1,084–1,089            | 1,023–1,028            | 1,038–1,043            | 877             |
| Tolleson                       |                                |                 |         |                        |                        |                        |                 |
| Agricultural                   | 782                            | —               | —       | 44–52                  | 57–65                  | 57–65                  | —               |
| Commercial                     | 183                            | —               | —       | 8–16                   | 8–16                   | 8–16                   | —               |
| Industrial                     | 1,744                          | —               | —       | 117–129                | 111–123                | 111–123                | —               |
| Open space                     | 38                             | —               | —       | —                      | —                      | —                      | —               |
| Public/Quasi-public            | 125                            | —               | —       | 5                      | 5                      | 5                      | —               |
| Residential (MF)               | 34                             | —               | —       | 0–1                    | 0–1                    | 0–1                    | —               |
| Residential (SF)               | 462                            | —               | —       | 0                      | —                      | 0                      | —               |
| Transportation                 | 148                            | —               | —       | 26–28                  | 26–28                  | 26–28                  | —               |
| Undeveloped                    | 291                            | —               | —       | 0–2                    | 32–34                  | 32–34                  | —               |
| Tolleson subtotal              | 3,807                          | —               | —       | 208–225                | 247–264                | 247–264                | —               |
| Total                          |                                | 936             | 1,061   | 1,306–1,314            | 1,284–1,292            | 1,299–1,307            | 877             |

Source: Arizona Department of Transportation aerial photography (2009, 2010, 2013); land use designations as of September 2009

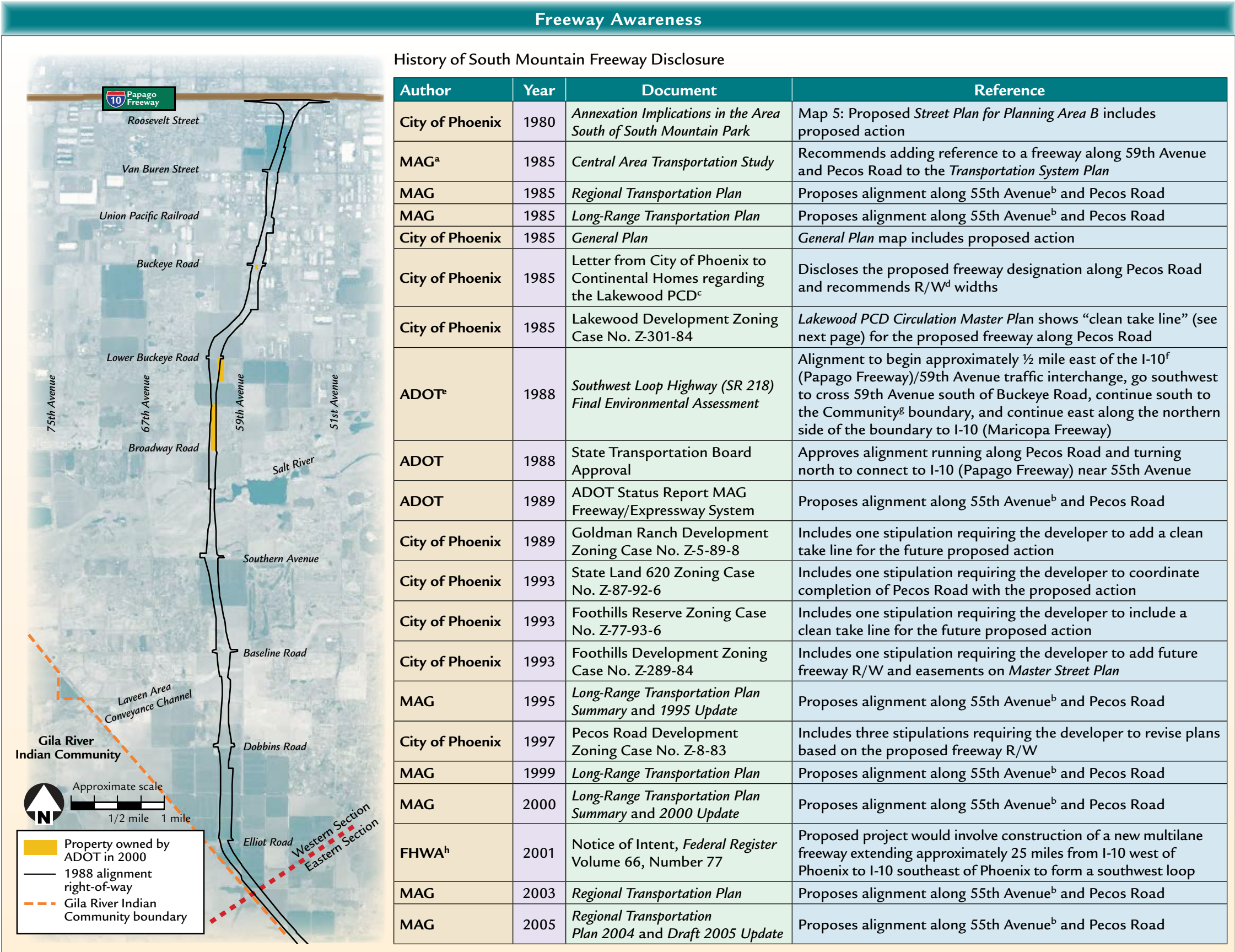
Note: W101 Alternative and Options include ranges because of design options; subtotals don't equal a simple summing of the land use acreages because the Partial and Full Reconstruction Options would affect land uses differently.

<sup>a</sup> not applicable   <sup>b</sup> multifamily   <sup>c</sup> single-family

**Impacts in the context of the proposed action**

Points to be considered regarding impacts presented in this chapter:

- The screening process undertaken (see the section, *Alternatives Development and Screening*, beginning on page 3-1) eliminated action alternatives from further study because of, in part, undesirable impacts on the natural and built environments. As an indirect result, the action alternatives discussed in this chapter represent actions to avoid, reduce, or otherwise mitigate impacts on the environment. By this measure, the magnitude of impacts presented in this chapter has been, to some degree, already reduced through the screening process.
- Some design features to reduce impacts have already been incorporated into the action alternatives presented in this chapter. For example, R/W needs of the E1 Alternative through SMPP have been minimized to reduce land use conversion impacts.
- *Impacts*, by definition, have a negative connotation and often are implicitly associated with having adverse effects. Projects like the proposed action, however, can also provide benefits for the environment. Where appropriate, benefits that would result from the proposed action are presented.



<sup>a</sup> Maricopa Association of Governments   <sup>b</sup> alignment most similar to the W59 Alternative   <sup>c</sup> planned community district   <sup>d</sup> right-of-way  
<sup>e</sup> Arizona Department of Transportation   <sup>f</sup> Interstate 10   <sup>g</sup> Gila River Indian Community   <sup>h</sup> Federal Highway Administration



Freeway Awareness (continued)

Phoenix first documented a future major transportation facility to serve the southwestern part of the city in a 1980 planning report, *Annexation Implications in the Area South of South Mountain Park*. The City recommended constructing a six-lane freeway interchange on Pecos Road and a six-lane street from I-10 (Maricopa Freeway) west on Pecos Road and continuing northwest to 51st Avenue (City of Phoenix 1980). In 1985, MAG modified the proposal by proposing a future six-lane freeway on a similar alignment (instead of the six-lane street). The MAG proposal was included in the 1985 *Long-Range Transportation Plan*, and the evolved South Mountain Freeway has been included in adopted long-range plans ever since.

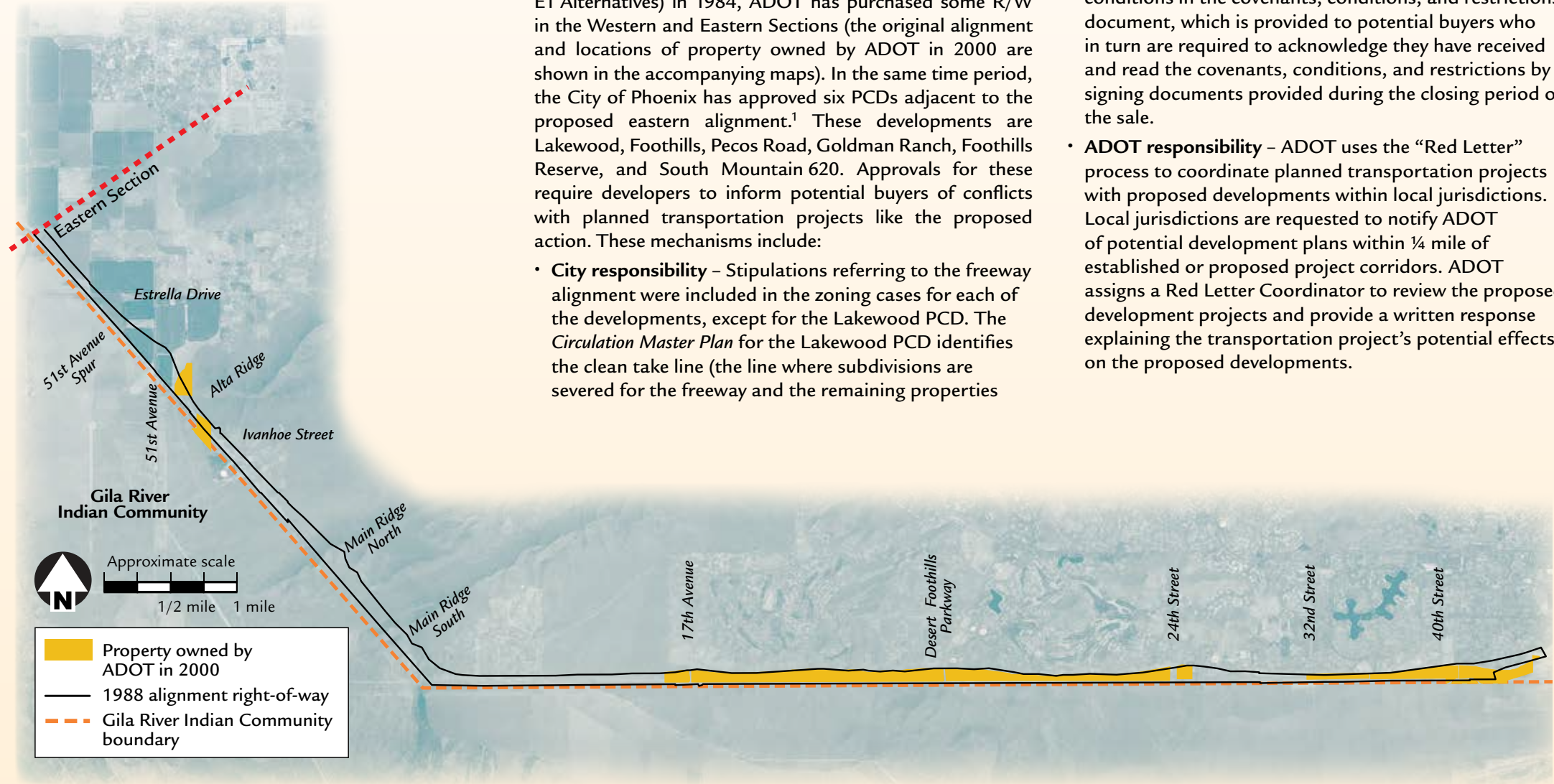
With the Study Area subject to continued land development projects, the proposed action would require acquisition of developed properties and relocation of property owners for R/W where there was once mostly vacant land. Public comments received from potentially affected property owners as part of the environmental impact statement (EIS) process suggest the City, land developers, and ADOT did not disclose the future freeway project. Review of previously published ADOT, City, MAG, and developer documents confirms freeway project and alignment disclosure has occurred since 1980, when the Study Area was still primarily vacant land (see accompanying table).

Since original adoption of the South Mountain Freeway alignment (an alignment similar to the W59 and E1 Alternatives) in 1984, ADOT has purchased some R/W in the Western and Eastern Sections (the original alignment and locations of property owned by ADOT in 2000 are shown in the accompanying maps). In the same time period, the City of Phoenix has approved six PCDs adjacent to the proposed eastern alignment.<sup>1</sup> These developments are Lakewood, Foothills, Pecos Road, Goldman Ranch, Foothills Reserve, and South Mountain 620. Approvals for these require developers to inform potential buyers of conflicts with planned transportation projects like the proposed action. These mechanisms include:

- **City responsibility** – Stipulations referring to the freeway alignment were included in the zoning cases for each of the developments, except for the Lakewood PCD. The *Circulation Master Plan* for the Lakewood PCD identifies the clean take line (the line where subdivisions are severed for the freeway and the remaining properties

continue to function as intended) for the future freeway. The City makes available a published media guide disclosing the freeway awareness stipulations or plan reference for each PCD.

- **Developer responsibility** – Arizona real estate law requires developers to disclose adverse conditions such as construction of a future freeway in a public document [5 Arizona Administrative Register § 650, R4-28-A1203]. Additionally, Arizona State Law states that subsequent purchasers have the right to “receive a copy of the public report and any contract, agreement or lease which fails to make disclosures . . . shall not be enforceable against the purchaser” (5 Arizona Administrative Register § 650, 32-2185.06). Developers typically disclose adverse conditions in the covenants, conditions, and restrictions document, which is provided to potential buyers who in turn are required to acknowledge they have received and read the covenants, conditions, and restrictions by signing documents provided during the closing period of the sale.
- **ADOT responsibility** – ADOT uses the “Red Letter” process to coordinate planned transportation projects with proposed developments within local jurisdictions. Local jurisdictions are requested to notify ADOT of potential development plans within ¼ mile of established or proposed project corridors. ADOT assigns a Red Letter Coordinator to review the proposed development projects and provide a written response explaining the transportation project’s potential effects on the proposed developments.



<sup>1</sup> see endnotes, beginning on page 4-191



Table 4-7 Land Use Conversion Acreage

| Land Use                 | Western Section  |     |         | Eastern Section |
|--------------------------|------------------|-----|---------|-----------------|
|                          | W59              | W71 | W101    | E1              |
| Agricultural             | 546 <sup>a</sup> | 488 | 674–807 | 162             |
| Residential <sup>b</sup> | 64               | 295 | 182–248 | 100             |
| Commercial/Industrial    | 166              | 209 | 175–207 | 11              |
| Open space/Undeveloped   | 158              | 63  | 76–157  | 554             |
| Public/Quasi-public      | 1                | 5   | 8       | 12              |

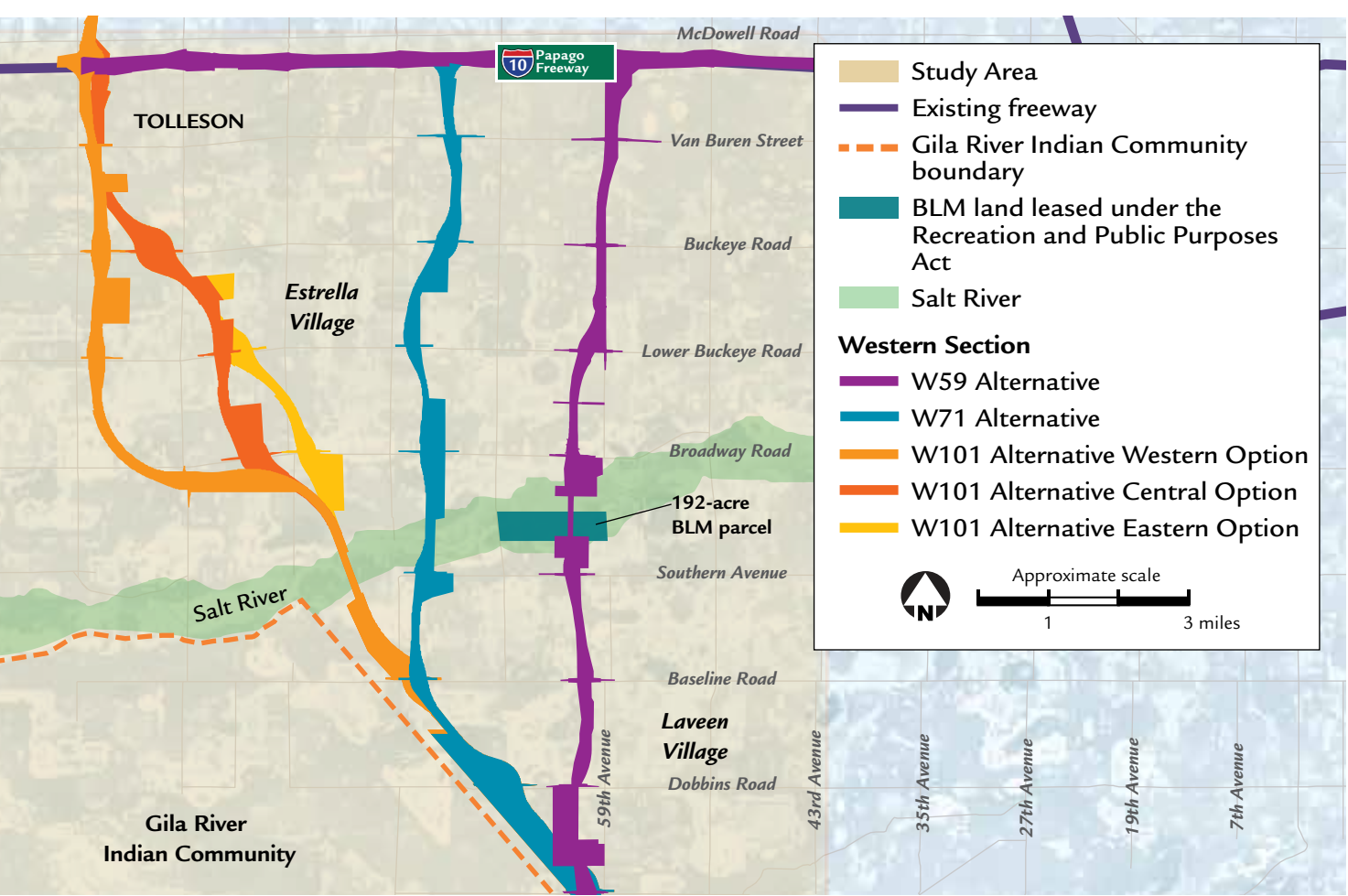
Note: W101 Alternative and Options include ranges because of design options.  
<sup>a</sup> in acres    <sup>b</sup> includes multifamily and single-family residential

4

In the recent past, rapid development has occurred through much of the Western Section of the Study Area. The Laveen Village area alone is anticipated to have a built-out population of over 105,000. This development places increasing demand on the street network. The Phoenix *General Plan* for Laveen Village has designated areas for commercial development that cannot support the projected densities without implementation of the proposed action. The Salt and Gila rivers interrupt the street network in the Study Area, creating a discontinuous grid that limits east–west and north–south mobility. Maricopa County added more people between 2000 and 2006 than did any other county in the nation. In the 15 years from 1990 to 2005, the county’s population grew by nearly 92 percent (U.S. Census Bureau 2007). Without the proposed action, the conversion of land from undeveloped and agricultural uses to residential, commercial, and industrial land uses would likely continue, placing a greater demand on the surface streets.

ADOT has preserved portions of the proposed R/W that could be applied to the E1 Alternative as a result of earlier studies and through strategic purchases to forestall development in anticipation of the construction of a transportation facility. If the No-Action Alternative were identified as the Selected Alternative, these parcels could be released, either through sale or other means, for future development. In such an instance, the existing zoning or the jurisdictions’ general plans would provide guidance for future land uses on these properties.

Figure 4-6 Land Leased for Rio Salado Oeste Restoration Project from Bureau of Land Management



Land under Bureau of Land Management (BLM) ownership has been conveyed through a lease agreement and the Recreation and Public Purposes Act to the City of Phoenix to support the eventual development of the Rio Salado Oeste restoration project of the Salt River riverbed.

Public Lands

Action Alternatives, Western Section

The W59 (Preferred) Alternative would cross the Salt River through the eastern half of a 192-acre Bureau of Land Management (BLM) parcel (Figure 4-6). Piers for the proposed freeway bridge structure would be constructed within the BLM parcel area. The BLM parcel includes a number of easements and R/W, including R/W for ditches and canals constructed by the authority of the Bureau of Reclamation (Reclamation), rights for a 12-inch water pipeline granted to the City of Phoenix, and a 150-foot-wide road easement granted to the Maricopa County Department of Transportation (MCDOT). In addition, the City of Phoenix has a lease on this parcel under the

provisions of the Recreation and Public Purposes Act for inclusion in the proposed Rio Salado Oeste project, a flood control and habitat restoration project cosponsored by the U.S. Army Corps of Engineers (USACE) (see text box on page 4-137). ADOT, FHWA, the City of Phoenix, BLM, and USACE would have to determine how to appropriate a portion of the land leased to the City for a federally funded transportation use. This situation would pertain only to the W59 Alternative, not the W71 Alternative or W101 Alternative and Options.

FHWA and ADOT met with the City of Phoenix and BLM on July 11, 2005, to discuss the lease and the action alternative that would pass through the leased property (the W55 Alternative—now the W59 Alternative). The

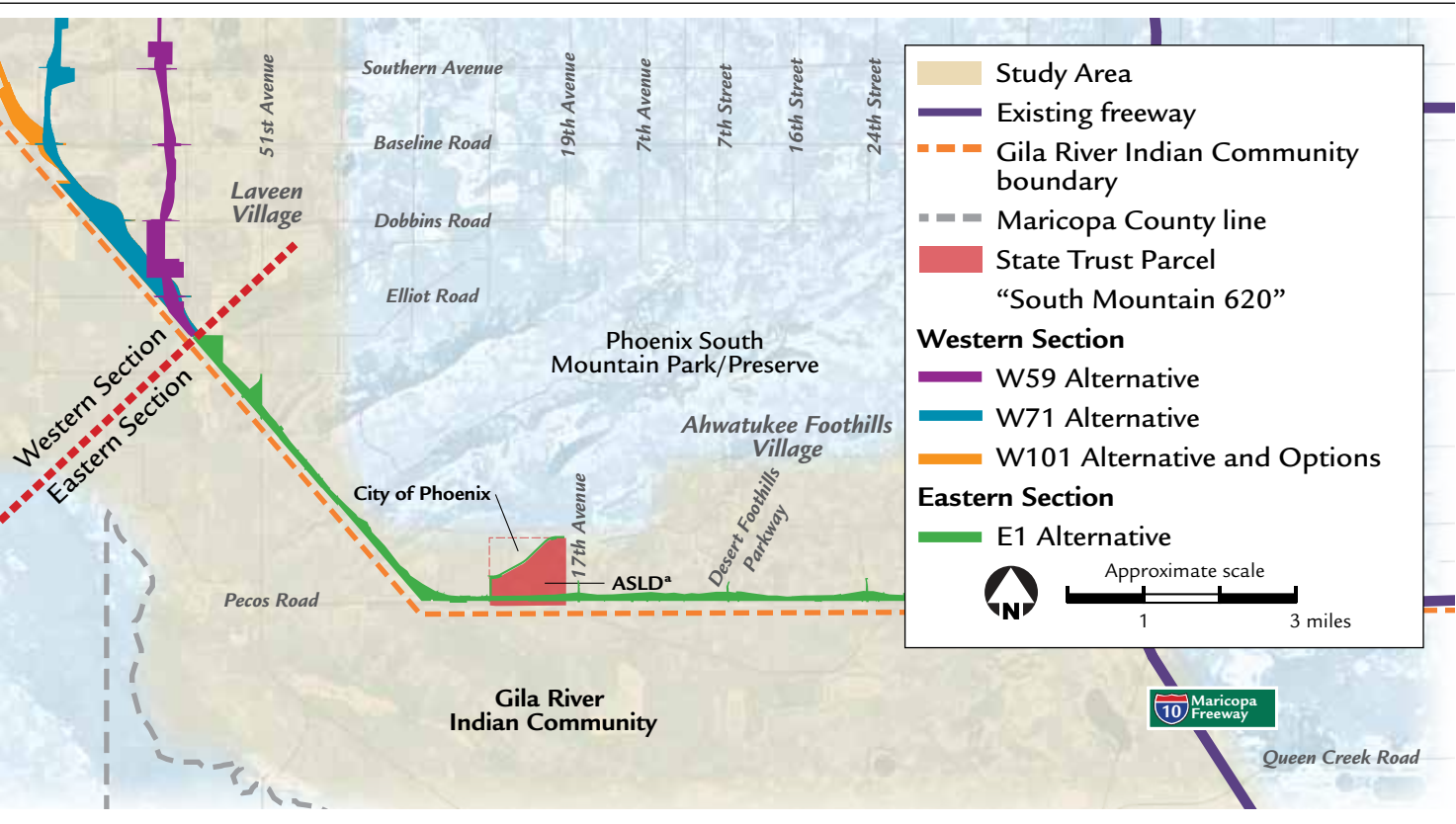
City of Phoenix (lessee) was aware of, planned for, and had incorporated the proposed South Mountain Freeway in its *General Plan* and in the conceptual plans for the Rio Salado Oeste project (see the map on page A698 in Appendix 4-8). It was further agreed that although the lease did not include a reference to the proposed freeway, the BLM (lessor) would support working in concert with the City of Phoenix to take the steps necessary to amend the lease in a manner that would allow the proposed freeway to pass through the property, if the W55 Alternative (currently the W59 Alternative) were identified as the Selected Alternative in the ROD. Both parties concurred with this approach in August 2005 (see Appendix 1-1). The project team would continue to consult with BLM, USACE, and the City of Phoenix to coordinate design efforts to minimize impacts on the proposed uses of this land.

According to USACE, the Rio Salado Oeste project lacks funding to proceed. As a result, the proposed construction of the South Mountain Freeway in this area would precede the habitat restoration project. Although traffic noise could affect some species, any wildlife that would inhabit the area after habitat improvements would experience the freeway as an existing condition and would become habituated to traffic noise. The City of Phoenix and USACE view the South Mountain Freeway crossing as an opportunity to direct stormwater runoff from the proposed freeway to “irrigate” the river habitat.

**Action Alternative, Eastern Section**

Within the city of Phoenix, the E1 (Preferred) Alternative would cross the southern end of a section of land owned by the Arizona State Trust and referred to as South Mountain 620 (Figure 4-7). The City of Phoenix purchased the northern 247 acres in 2009 for expansion of SMPP, including a trailhead, active parkland, and public facilities. The parcel is zoned PCD, and the development plans proposed for the parcel have been consistent with single-family residential development occurring in the city to the east and west. Five easements for public utilities with the City of Phoenix and Salt River Project (SRP) pass through the parcel. ADOT would have to coordinate with the Arizona State Land Department (ASLD) for the conversion of State land to a transportation use.

**Figure 4-7 State Trust Land, Eastern Section**



State Trust land has been the subject of several proposals for development projects. <sup>a</sup> Arizona State Land Department

The E1 Alternative would cross the western edge of SMPP. The land is owned by the City of Phoenix through a land grant provided to the City under the provisions of the Recreation and Public Purposes Act. Chapter 5, *Section 4(f) Evaluation*, further addresses the impacts and actions needed to reduce impacts from the E1 Alternative crossing the western edge of SMPP.

**No-Action Alternative**

The No-Action Alternative would have no adverse effect on public land ownership in the Study Area. If a freeway were not built along the E1 Alternative, other uses of land through the southern portion of South Mountain 620, which was identified for potential use by a freeway, may occur. If a freeway were not built, this parcel may still undergo conversion because the property is zoned for residential and neighborhood commercial development.

**Land Use Compatibility**

Land use impacts caused by all the action alternatives may extend beyond the proposed R/W and would include issues

of access, community cohesion, economics, air quality, noise, cultural resources, visual impacts, and farmlands. These land use-related impacts are discussed in the sections, *Social Conditions*, *Economic Impacts*, *Air Quality*, *Noise*, *Cultural Resources*, *Visual Resources*, and *Prime and Unique Farmlands*, found elsewhere in this chapter.

The compatibility of land uses with the action alternatives and the No-Action Alternative was assessed by considering land uses within a ¼-mile buffer of the action alternatives’ proposed R/W. The compatibility of a major transportation facility with existing land uses may have positive and negative consequences. Factors affecting land use compatibility of the proposed action would be:

- **Agricultural uses** – generally incompatible because the action alternatives:
  - would hasten planned conversion to urban uses (residential, industrial, or commercial land uses) as a result of the improved access (this issue is addressed in the section, *Secondary and Cumulative Impacts*, beginning on page 4-179)



*Agricultural is a predominant land use in the Study Area, but that status is changing.*



- may fragment agricultural parcels, making the parcels unsuitable for agriculture
- conversion of agricultural land to more urbanized uses has an impact on low-income and minority workers, as the majority of all farmworkers are foreign born, and nearly one-quarter of all farmworkers have family income levels below the national poverty guidelines (National Center for Farmworker Health 2012)
- **Regional and community commercial uses** – generally perceived as compatible because the action alternatives:
  - would improve access and exposure to a larger market with likely benefits from proximity to a freeway corridor
  - may not require substantial mitigation (e.g., noise barriers) and can provide a buffer between a major transportation corridor and less intensive uses and/or more sensitive uses, such as multifamily and single-family residential
- **Neighborhood commercial uses** – generally perceived as incompatible because the action alternatives may divide service areas, potentially resulting in limited local access and negatively affecting the market share necessary for their sustainability. Generally, neighborhood businesses rely on a local customer base; however, the proposed action may provide additional access to some neighborhood businesses.
- **Industrial uses** – generally perceived as compatible because the action alternatives:
  - would improve access to regional transportation routes as primary factors necessary for industry; the Study Area and its surroundings are characterized by a large amount of industrial development (see text box on page 3-64 regarding the Phoenix metropolitan area as a major distribution hub)
  - may not require substantial mitigation (e.g., noise barriers) and can provide a suitable buffer between a major transportation corridor and less intensive uses such as commercial and residential development
- **Open space uses** – near a transportation corridor may or may not be compatible; the degree of compatibility depends on a number of factors, including the scale and purpose of the facility:
  - Open space generally is perceived as not compatible because the action alternatives:
    - may adversely affect open space set aside for habitat preservation if they were to provide unwanted access to the open space area or if noise from the facility were to disturb wildlife
    - may fragment an open space area and make the area a less suitable habitat for plants and animals
    - may limit direct access to the open space serving a local community
  - Open space generally is perceived as compatible because the action alternatives:
    - would beneficially enhance access to a regional park
    - may be buffered from incompatible uses such as residential development by the open space
    - may effectively limit access to a sensitive open space area, to the area's benefit
- **Public/Quasi-public uses** – near a transportation corridor may or may not be compatible and largely depend on the type of use:
  - Public/Quasi-public uses generally are perceived as compatible because the action alternatives:
    - would provide enhanced access to regional facilities such as colleges and special event venues
    - may provide enhanced access to emergency response services
  - Public/Quasi-public uses generally are perceived as not compatible because the action alternatives:
    - may introduce undesirable noise or other secondary impacts on outdoor amphitheaters or other outside venues
    - may bisect service areas for facilities (e.g., churches, schools) serving local communities and, therefore, limit user access
- **Multifamily residential uses** – while generally not perceived as compatible, a transportation corridor may be compatible because the action alternatives:
  - help to mitigate the effect of increased land use intensity and increased traffic generated (when compared with single-family residential uses) by facilitating access to the regional freeway system, thereby improving residents' mobility and alleviating congestion on the local street network
  - may require less mitigation for noise, air quality, and visual intrusion because of fewer exterior walls per dwelling unit in a multifamily development than in a single-family residential development
- **Single-family residential uses** – generally not compatible with transportation corridors because the action alternatives:
  - would introduce visual, air quality, noise, and other intensive impacts on a comparatively sensitive land use
  - may isolate portions of planned communities, limiting access to infrastructure and services
  - would, however, provide easy access to the regional freeway system for commuting purposes (for those residing close to a freeway)
- **Undeveloped land** – near a transportation corridor may or may not be compatible and would largely depend on the type of use. Regarding the Study Area, undeveloped land is generally privately owned; compatibility would be a function of its planned land use, determined by zoning and the jurisdiction's adopted general plan.

Following these guidelines, the W59 Alternative would generally be the most compatible with existing land uses in the Western Section, although it would affect two apartment complexes and single-family residences as a result of R/W requirements for the system traffic interchange with I-10 (Papago Freeway). The W71 and W101 Alternatives would traverse larger areas of existing, developing, and planned residential development than would the W59 Alternative and would present greater areas of incompatible land use.



In the Eastern Section, the E1 Alternative would pass through both largely undeveloped land and open space along an alignment planned since the late 1980s in its western end, and through an area of intense urban/suburban residential development in its eastern end. While its compatibility would be subject to the scale and purposes of the open space (SMPP) and the undeveloped land (either set aside for a transportation corridor or for residential development), the E1 Alternative through the western areas generally would be incompatible. While some land use benefits may be derived (e.g., reducing uncontrolled access to sensitive open space), the action alternative would introduce an intensive transportation use adjacent to an otherwise passive setting along the southwestern edge of SMPP. The impact of the E1 Alternative on SMPP and the cultural importance of the park to Native American communities are discussed in the section, *Cultural Resources*, beginning on page 4-140, and Chapter 5, *Section 4(f) Evaluation*.

The E1 Alternative would also be adjacent to largely residential areas of Ahwatukee Foothills Village (to the north) and agricultural land to the south, on Community land. While a freeway has been planned in this location for many years, it is recognized that the intensive transportation use would generally be incompatible with residential uses. Recently approved planned development for commercial uses on Community land adjacent to the E1 Alternative suggests the Community anticipates the construction of the proposed action immediately adjacent to Community land.

Land use compatibility impacts caused by the No-Action Alternative are incorporated by reference to the section, *Land Use Conversion*, beginning on page 4-9. In addition, the compatibility of land uses in the Study Area would be a function of planned land use as determined by zoning, the jurisdictions’ adopted general plans, and the land development approval processes as established by those jurisdictions.

Land Development Plans

The proposed action may affect implementation of the 102 planned developments previously referenced. The effects of implementation of the action alternatives on development plans could include:

Table 4-8 Planned Developments Potentially Affected by Action Alternatives

| Status              | Western Section |     |                     |                     |                     | Eastern Section |
|---------------------|-----------------|-----|---------------------|---------------------|---------------------|-----------------|
|                     | W59             | W71 | W101 Western Option | W101 Central Option | W101 Eastern Option | E1              |
| Active <sup>a</sup> | 0               | 1   | 1                   | 2                   | 3                   | 3               |
| Planned             | 11              | 6   | 9                   | 8                   | 8                   | 1               |
| Total               | 11              | 7   | 10                  | 10                  | 11                  | 4               |

<sup>a</sup> active developments as of July 2013

Sources: Cities of Avondale, Glendale, Goodyear, Phoenix, and Tolleson

- converting portions of the development to project-related uses
- fragmenting land uses, rendering portions unsuitable for their approved purpose
- locating incompatible land uses adjacent to the action alternative
- disrupting local road networks and affecting access

Of the action alternatives in the Western Section (Table 4-8), the W101 Alternative Eastern Option and W59 Alternative would each affect the greatest number of developments (11). The 7 developments potentially affected by the W71 Alternative would be the least of all action alternatives.

To provide a detailed assessment of impacts on these planned developments is premature because of the dynamic nature of development site plans up until the time of construction. Where possible, ADOT has been working with developers to apprise them of the proposed project. In some cases, impacts have been assessed based on available development plans. For example, impacts on planned housing were assessed using the zoned number of residences in the development.

In the Eastern Section, the E1 Alternative would affect four planned developments. The low number reflects the fact that a large portion of the action alternative would pass through open space and already developed lands.

The No-Action Alternative would affect planned developments in the vicinity of the W59 and E1 Alternatives. These developments were planned with the assumption of a freeway adjacent to the development.

Many factors play into the planning and locating of major land development projects (e.g., subdivisions, planned communities, commercial centers). The relationship of the planned project to the location of a major transportation facility would be a factor. In some instances, the development would be purposely planned away from the transportation facility (e.g., a planned community) to ensure that the proposed freeway would not bisect it. In other instances, the development may be located adjacent to or immediately around the proposed freeway. The development plan for the approximately 480 acres in the Laveen Village urban core is one such example. This area is planned for the “Laveen Core,” a mixed-use commercial development, based on proximity to the freeway alignment shown on the City of Phoenix’s adopted *General Plan* land use map.

Zoning

Comparison of agriculturally zoned land (Table 4-4 on page 4-7) with existing agricultural land uses (Table 4-2 on page 4-3) illustrates that much of the zoning necessary to convert agricultural and undeveloped land to more urbanized uses has already been put in place (see sidebar on page 4-3). Industrial land uses account for approximately 8,499 acres of existing land use in the Study Area, whereas industrial zoning for the Study Area accounts for a total of 10,144 acres. While the development of urbanized uses may be hastened by implementation of an action alternative, review of the in-place zoning indicates that the process of conversion is already underway (see the section, *Historical Context of the Proposed Action*, beginning on page 1-5, to learn more about factors affecting regional growth).

*Would the location of the proposed action affect the RTP?*

Public comments have been received suggesting the selection of any location other than near the W59 Alternative alignment (or the selection of the No-Action Alternative) would require modifications to the RTP. The RTP included an alignment for the South Mountain Freeway that closely followed the W59 Alternative. A footnote to Figure 1-2, on page 1-6, indicates that the EIS/design concept report (DCR) study process is underway and is considering multiple location options. If any major modifications to the RTP are necessary because of the findings of the study process, MAG would need to follow the process outlined in A.R.S. § 28-6353.

The No-Action Alternative would not affect existing zoning, except in the instance of planned development where zoning is in place. Zoning in the Study Area would be a function of planned land use as determined by the jurisdictions’ adopted general plans and the land development approval processes as established by those jurisdictions.

Rural areas, such as those zoned agricultural or very low-density residential (such as Maricopa County’s R-43 Rural Zoning District, which allows one dwelling unit per acre, or the City of Phoenix’s S1 Ranch or Farm Residence District, which is meant to preserve low-density areas of farm or residential uses), would continue to be rezoned as the areas become more suburban—consistent with the affected communities’ long-range plans.

**Long-range Plan Compatibility  
Action Alternatives, Western Section**

*Avondale*

The City of Avondale’s adopted *General Plan* (2012) does not specifically call out the South Mountain Freeway. The plan’s land use map does, however, designate land adjacent to and near I-10 (Papago Freeway) for commercial and employment uses. The W101 Alternative would provide improved transportation access to this area and, therefore, would be compatible with certain goals of the City’s *General Plan*. The *General Plan* designation for the affected undeveloped land is industrial (considered compatible with a freeway use like the proposed action).

*Phoenix*

The City of Phoenix’s adopted *General Plan* (updated in 2002) divides the municipality into 15 planning areas referred to as villages. The Western Section includes portions of Estrella, Laveen, and a small portion of Maryvale (north of I-10 [Papago Freeway]) villages. The Estrella and Laveen planning areas are identified as “growth areas” to enable the planning areas to provide cost-efficient public facilities and expanded city services to anticipated housing and employment development.

The City’s *General Plan* land use map shows the freeway alignment as “Future Transportation” (land use category), generally matching the W59 (Preferred) Alternative alignment. The City of Phoenix’s plans for both Laveen and Estrella villages identify “cores” along the W59 Alternative, surrounded by commercial/mixed-commercial uses for each planning area clearly intended to benefit from proximity to the proposed freeway. In addition to the “called-out” commercial cores, the land uses north of the Salt River near the W59 Alternative are largely industrial (considered compatible with a freeway use). The alignment of the South Mountain Freeway as reflected in either the W71 or W101 Alternative is not identified or described in the City’s *General Plan*. The plan and related maps would have to be amended accordingly.

*Tolleson*

The majority of Tolleson is planned for industrial uses (61 percent of the planning area). Residential areas are located in the area surrounding the 91st Avenue/Van Buren Street intersection. The City plans to retain what it refers to as its “compact, neighborhood-oriented land use form.” Its *General Plan* (2005) promotes economic development and community character.

The W101 Alternative would bisect a portion of the western side of the city and affect an area of future residential, industrial, and commercial land uses. Community, land use fragmentation, and economic impacts would occur (see the sections, *Social Conditions* and *Economic Impacts*, beginning on pages 4-20 and 4-56, respectively, for further detail). The vision of the City’s *General Plan*, to create economic development areas and community character, would become more difficult to achieve under the W101 Alternative. The City would have to amend its *General Plan* and adopted land use maps.

Adjacent to the city, the W71 Alternative would provide access to its commercial and industrial areas, and the footprint of the action alternative would not reduce the amount of land available for development. The alternative would aid in providing access to a planned employment corridor in Tolleson. Neither the W71 nor

W59 Alternative would adversely affect the City of Tolleson’s long-range planning efforts.

*Glendale and Goodyear*

Long-range planning for the cities of Glendale and Goodyear are excluded from the future land use discussion because no direct impacts would occur beyond approximately a mile from the action alternatives.

**Action Alternative, Eastern Section**

*Chandler*

A small portion (773 acres) of the city of Chandler is within the Study Area. The area is designated by the City’s adopted *General Plan* (2008) for employment, defined as “proposed or existing industrial parks or developments as well as industrial support uses designated to house the City’s industrial base.” The City of Chandler’s land use plan includes the proposed action along the Pecos Road alignment. Existing and planned industrial uses near the E1 (Preferred) Alternative and its interchange with I-10 (Maricopa Freeway) are industrial and would be compatible with a transportation facility connecting to the existing SR 202L (Santan Freeway).

*Phoenix*

The E1 Alternative would run along the southern edge of the Ahwatukee Foothills Village planning area (and would border Community land, to the south) as established in the City of Phoenix’s adopted *General Plan*. The planning area includes an area designated as the village “core,” located north of and away from the E1 Alternative at the 48th Street/Ray Road intersection. The City’s adopted land use map shows a freeway alignment as “Future Transportation” (land use category), generally following the E1 Alternative alignment. The action alternative would be consistent with the City’s adopted *General Plan*.

**No-Action Alternative**

The No-Action Alternative would adversely affect the City of Phoenix’s long-range plan, which identifies village cores for the Laveen and Estrella planning areas.



The land use plan designations associated with these cores are predicated, in part, on proximity to the freeway corridor, as shown on the City’s adopted *General Plan* land use map (which approximates the W59 Alternative). For example, commercial and industrial land use plan designations are often geographically located near major transportation corridors to promote efficient movement of goods and delivery of services. By not locating such a corridor where originally planned, the planning logic of land use distribution is altered. In this example, specifically, the local jurisdiction may choose to redistribute land use plan designations, which in turn could create conflict with existing land uses. Regardless of any decision associated with such an action, the plan and related maps would have to be amended accordingly. Ahwatukee Foothills Village has no planning area plan; therefore, there is no incompatibility under a No-Action Alternative.

MITIGATION

Mitigation for land use-related impacts (e.g., visual and audible intrusions) are discussed in the sections, *Social Conditions* (beginning on page 4-20), *Displacements and Relocations* (beginning on page 4-46), *Economic Impacts* (beginning on page 4-56), *Air Quality* (beginning on page 4-68), *Noise* (beginning on page 4-88), *Cultural Resources* (beginning on page 4-140), *Prime and Unique Farmlands* (beginning on page 4-161), and *Visual Resources* (beginning on page 4-167), and in Chapter 5, *Section 4(f) Evaluation*. Parties responsible for implementing the measures are identified in those sections.

ADOT Design Responsibilities

For the W59 and E1 Alternatives, ADOT and FHWA would coordinate with the entities (BLM and ASLD) managing affected public land and the various leaseholders to accommodate the proposed action.

CONCLUSIONS

Implementation of any of the action alternatives would convert existing land uses to a transportation use. In the Western Section, implementation of the W101 Alternative would convert the most land because its alignment is longer than other action alternatives in that section. The E1 (Preferred) Alternative, in the Eastern Section, would also convert existing land uses to a transportation use, although some land conversion would be associated with the transformation of Pecos Road from a major arterial street to a freeway use.

In the Western Section, implementation of the W101 Alternative would convert between 1,284 and 1,314 acres; the W71 Alternative would convert 1,061 acres; and the W59 (Preferred) Alternative would convert 936 acres. In the Eastern Section, the E1 Alternative would convert 877 acres (some of which are associated with Pecos Road). The locations and types of existing and planned land uses would vary by action alternative and option. Regardless of which specific action alternative may be implemented—if any—the total conversion of existing land use to a transportation use would be negligible when placed in the context of the amount of land in the region. Therefore, impacts on the availability of existing and planned land uses would be minimal.

Furthermore, vacant and agricultural land is rapidly being converted in the Phoenix metropolitan area, and this trend would be expected to continue despite proposed action implementation; Study Area land uses will look different in years to come. While the majority of agricultural workers are presumed to be minority, the agricultural employment in the region is

steadily decreasing as agricultural uses are replaced with development. In 2000, much of the Western Section was agrarian and rural in character; by 2035, Study Area land uses are expected to reflect a more urbanized setting, with single-family residential communities, commercial cores, and industrial corridors, regardless of which or whether any action alternative were to be implemented.

Of the action alternatives in the Western Section, the W59 Alternative would be most compatible with adjacent industrial land uses; the W71 and W101 Alternatives would, by contrast, traverse large areas of existing and planned residential development. The E1 Alternative, in the Eastern Section, would generally be incompatible with the natural land and primarily residential areas immediately north of the alignment. Regardless of which specific action alternatives may be implemented—if any—the types of adjacent land uses would be comparable to those found along much of the region’s freeway system.

The proposed transportation facility has been planned through local and regional long-range planning efforts. Of the action alternatives, the W59 and E1 Alternatives would be most consistent with regional and local long-range planning efforts ongoing since the mid-1980s. The W101 Alternative and its Options would be the least consistent of the action alternatives; of the three action alternatives in the Western Section, it would have the greatest impact on the City of Tolleson’s land uses and long-range planning efforts.

How communities change

With the growth in the region, communities and their neighborhoods are created and evolve. Patterns of life develop within these communities, contributing to a sense of place for its residents. Issues such as mobility, continuity, character, inclusion, and maintenance of a sense of place become important aspects to the individuals who reside in these communities. The proposed action has the potential to alter conditions important to communities’ residents. Consequences could be both adverse and beneficial to those aspects important to communities, neighborhoods, and their residents. Determining impacts on social conditions involves individuals’ opinions and preferences as to what is important to them and their behavior in a community. It involves the community itself and what makes it unique or gives it its character. Often, with this matter, communities—particularly those in the Phoenix metropolitan area—are changing; communities in 2014 may look quite different in 2035.

Phoenix: The nation’s sixth-largest city

The 2010 census conducted by the U.S. Census Bureau identified Phoenix as the country’s sixth-largest city. The census also showed that Phoenix had increased in population by 10 percent in just 10 years, attesting to Phoenix’s rapid growth in the 2000s. Maricopa County grew even faster—by 25 percent in the 10 years since the 2000 Census—to 3.8 million people.

SOCIAL CONDITIONS

Social conditions are the results of interactions of humans with one another, over time, and of observable patterns and characteristics that they create in their surroundings. Social conditions include demographic characteristics, community character, and public facilities related to societal activities. Economic conditions, displacements and relocations, and matters relating to environmental justice and Title VI of the Civil Rights Act of 1964 (Title VI) are treated in stand-alone sections in this chapter.

AFFECTED ENVIRONMENT

Demographic Characteristics

Key demographic characteristics of the Study Area include race, income, employment, housing, and population growth. Population growth is an important socioeconomic factor because of its direct influence on housing and employment growth and on existing and planned transportation facilities and infrastructure. Population growth influences the demand for all modes of transportation and catalyzes construction of highway facilities, provision of mass transit services, and construction and installation of bicycle and pedestrian infrastructure.

Regional Demographic Context

By 1950, the city of Phoenix had grown to a population of 107,000 in an area of 17 square miles. This growth was an indicator of the city’s potential to become a regional population and economic center. By 2010, Phoenix was the nation’s sixth-most populous city, with 1,445,632 residents and an area of 519 square miles (U.S. Census Bureau 2010a; City of Phoenix 2009a); see the section, *Historical Context of the Proposed Action*, beginning on page 1-5, for additional information regarding population, housing, and employment growth.

Population growth experienced between 2000 and 2010, a product of both in-migration and natural increase, changed the racial composition of the city of Phoenix. During this time, the White population, as a percentage of the total population, decreased from just over 71 percent to just under 66 percent. Hispanics

marked the greatest percentage increase, growing from 34 percent to 41 percent. Because Hispanics may self-identify on the census form as being White (racially) and as being Hispanic (as an ethnicity), the above percentages may not be directly comparable, i.e., some percentages of census respondents may consider themselves to be in both groups. The percentages should be taken only as rough measures of demographic change. The second-largest increase was in the “some other race” classification, increasing from 16 percent to nearly 19 percent. Other racial classifications—Black/African American, American Indian/Alaskan Native, and Asian—all experienced increases between the census years, with Black/African American and Asian groups seeing the greatest gains. (This discussion uses U.S. Census Bureau classifications for race and ethnicity.) Additional discussion of race and ethnicity may be found in the section, *Environmental Justice and Title VI*, beginning on page 4-29. Overall, the Study Area is more racially diverse than both Maricopa County and Arizona.

Population and Employment

Between 2000 and 2010, population within census blocks in the Study Area increased by more than 72 percent. By comparison, the population of Arizona increased by 25 percent, Maricopa County increased by 24 percent, and the population of the city of Phoenix increased by 10 percent.

Between 2000 and 2010 the greatest change in population in the Study Area occurred in and around the Laveen Village planning area, whose population increased more than tenfold from less than 4,000 to over 47,500. Between 2000 and 2010, the Estrella Village planning area experienced the greatest population increase, from 15,500 to over 83,000. Ahwatukee Foothills Village saw more modest growth, increasing in population from nearly 56,000 in 2000 to over 77,000 in 2010.

Maricopa County’s population is projected to increase by 53 percent between 2010 and 2035, from 3.8 million to nearly 5.8 million (U.S. Census Bureau 2010a; MAG 2013b). The number of housing units is projected to increase by 46 percent between 2010 and 2035 to accommodate the expected growth in population.

Employment is expected to grow by 70 percent, increasing from approximately 1.7 million jobs in 2010 to nearly 2.9 million in 2035. A portion of this growth would occur in and around the Study Area. The total population in the Study Area is expected to grow at a faster rate than the county, increasing from 292,000 in 2010 to 456,000 in 2035 (see the section, *Need Based on Socioeconomic Factors*, beginning on page 1-11, to learn more about the region’s growth). Employment in the Study Area is expected to increase by approximately 110 percent, from 125,000 jobs in 2010 to 262,000 in 2035. As with population, the greatest increase in employment is expected to occur in the Western Section of the Study Area in the vicinity of Laveen and Estrella villages.

Housing Stock and Valuation

Over 327,000 housing units (94 percent of them occupied) in 2010 were within the census block groups in the Study Area. Of the owner-occupied housing units, 43 percent (4 percentage points below the Maricopa County average) were valued below \$125,000.

Relative to the rest of the Study Area, median housing values are highest in Ahwatukee Foothills Village. The area north of Southern Avenue has a variety of housing types, with most census block groups having median home values ranging from \$85,000 to \$130,000. To keep pace with anticipated population growth, a range of housing proposals is in various stages of development in the Study Area (see the section, *Development Plans*, on page 4-7).

Community Character

In recent years, most of the Study Area has changed from rural and agricultural to moderate-density, homogenous single-family residential (the southwestern portion of the Phoenix metropolitan area has been one of the fastest-growing areas in the state). Generally, with the exception of a few distinct locations, the area can be characterized as transitional.

In the Western Section, agricultural and open-desert land is rapidly changing to residential uses, with concentrations of residential and mixed commercial/



light industrial uses. The trend toward urbanization is evident in the form of newly constructed and proposed residential subdivisions, warehouse and distribution facilities, and office and light industrial parks, as well as large master-planned residential developments that often include commercial as well as recreational components.

From 2000 through 2012, the changing character of the area was evident from the numerous posted notices of zoning change requests. Road and infrastructure improvements and new school construction were other signs of local area governments responding to this growth activity. New commercial centers at formerly remote intersections (e.g., the northeastern corner of 83rd Avenue and Lower Buckeye Road) also indicate that new residential development triggered retail development activity. In some areas, new growth during this period led to a mix of new master-planned, suburban-density subdivisions and commercial establishments amid scattered, older rural homesteads and open fields. Since 2007, because of the worldwide economic downturn, growth in the region has slowed. This state of flux, however, remains evident, which makes community character difficult to define. A few communities, however, do exhibit distinct characteristics (see Figure 4-8).

Community Facilities and Services

Figure 4-9 illustrates the location of public facilities in the Study Area. With continued planned development in this area, more community facilities in the form of schools, public complex facilities, churches, and parks will appear.

ENVIRONMENTAL CONSEQUENCES

All Action Alternatives, Western and Eastern Sections

For all action alternatives, increased road capacity would improve overall circulation and accessibility in both the Study Area and the greater Phoenix metropolitan area, benefiting existing and future residents, employees, and employers (see Chapter 1, *Purpose and Need*, which further addresses traffic performance). Overall, the local arterial street network would experience a reduction in traffic when compared with the No-Action Alternative

(some traffic would shift to a freeway from the local street system). Local travel times through a given area would improve. This would also make local roads more attractive and safer for pedestrian and bicycle circulation. Travel times for local buses would also improve. This would benefit low-income and minority populations; according to the *2010–11 Valley Metro Transit On-Board Survey Report*, one-third of bus riders are minority and more than half have annual household incomes below \$25,000 (according to the U.S. Department of Health and Human Services, the 2013 poverty threshold for a family of four is \$23,550).

Some localized impacts would be experienced where the movement of traffic between a freeway and the local street network would lead to peak-hour congestion at service traffic interchanges. This would lead to delays in the vicinity, potentially affecting nearby commercial and neighborhood areas (the effects would be offset by optimizing service traffic interchange operation through design and by the RTP-planned arterial street improvements where applicable).

The southwestern segment of SR 202L (South Mountain Freeway), as represented by the proposed action, has been part of the region’s adopted long-range transportation planning efforts to accommodate regional mobility needs since 1985 and is reflected in the planning goals established for the next 20 years (see Chapter 1, *Purpose and Need*, and Chapter 3, *Alternatives*, regarding past and ongoing regional planning efforts). Land use planning and transportation planning are intrinsically tied. In the Phoenix metropolitan area, the proposal to construct the proposed action (and other transportation projects of similar magnitude) is coordinated by MAG and is a result of affected municipalities’ general planning processes. As typical in the region, the construction of a project like the proposed action is the direct result of planned land use development of residential areas, employment centers, and commercial developments. These factors are based to a large extent on past growth trends and projections for population, housing, and employment. The actualization of long-range planning efforts depends, in part, on the planned Regional Freeway and Highway System being in place.

The action alternatives would not adversely affect access from area neighborhoods to schools through the use of major arterial streets. Existing and planned bus routes may be altered, but travel times would not be adversely affected. Most existing and planned schools would be near one or more of the action alternatives on or near major arterial streets. The action alternatives would also improve access for residents to school facilities and community centers that are used for after-school day care and recreational and educational activities. This would be beneficial for all residents, including low-income residents who rely on these social services.

Response times for police, fire, and medical emergency services would be faster when compared with response times under the No-Action Alternative. Circulation on major arterial streets would be improved through better distribution of traffic onto the overall transportation network, the provision of alternative routes, and through localized operational improvements such as grade separations and planned interchanges.

The action alternatives would substantially reduce the number of vehicles that pass through Community land on 51st Avenue and Beltline Road. Impacts on community character and cohesion are described in Table 4-9. As evident in the table, primary adverse impacts from action alternatives would occur on those Study Area communities with distinct characteristics (see Figure 4-8 for descriptions of the communities).

No-Action Alternative

No project-related impacts on community character and the cohesiveness of neighborhoods—existing or now undergoing development—or on commercial/industrial areas would occur as a result of identification of the No-Action Alternative as the Selected Alternative. Increasing congestion on the local street network would, however, be expected, especially in the most rapidly urbanizing portions of the Study Area if a controlled-access, high-speed travel option were not available to area residents, businesses, and visitors. During the next 25 years, daily traffic volumes in the Study Area are expected to increase by approximately 41 percent on freeways and arterial streets. This 41 percent increase in

Cohesion and character of communities

A neighborhood’s cohesiveness is considered to be adversely affected when the proposed action would:

- eliminate or adversely change existing circulation within the neighborhood
- eliminate neighborhood access to commercial areas, schools, parks, or other community amenities
- create a physical barrier to movement within the community

The character of a community is considered to be adversely affected when the proposed action would:

- substantially reduce the physical size of a distinct community
- introduce an intensive land use within passive land uses such as agricultural or open space that are within a distinct community
- introduce freeway-generated intrusions such as unmitigated substantial noise, traffic congestion, or visual blight

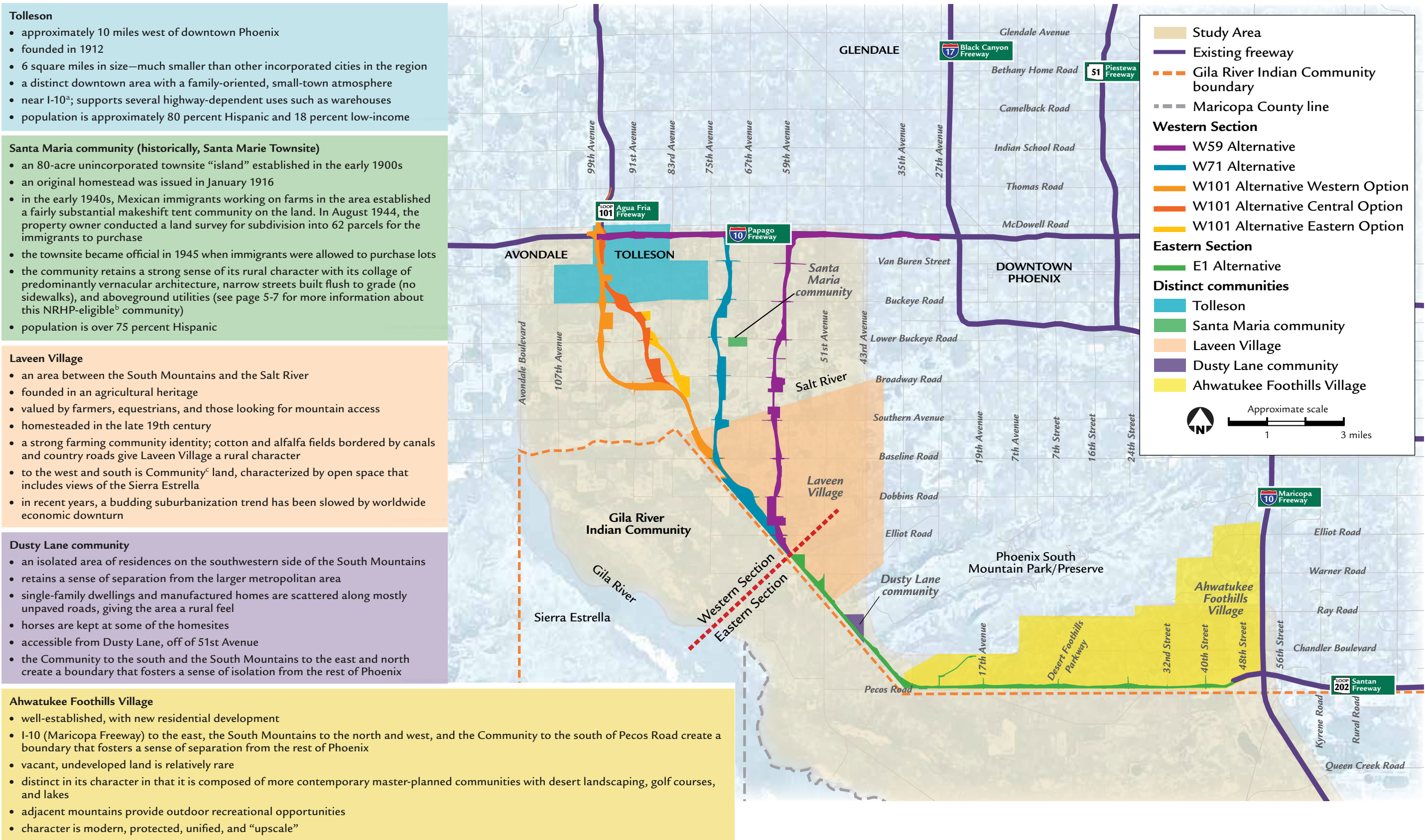
Freeways and crime

In 2005, the City of Phoenix Police Department staff met with the South Mountain Citizens Advisory Team (SMCAT) (see page 6-7) to discuss the relationship of crime and freeways. The following are highlights from the meeting:

- Crime changes are influenced by a wide variety of factors and it would be difficult to determine whether a new freeway had any effect.
- Based on experience, there did not appear to be any correlation between crime rates and freeways.
- The City of Phoenix Police Department does not have any statistics specific to crime adjacent to freeways.
- Crime suspects who use freeways to get away are typically the easiest to catch.
- Crime seems to be more related to what is built adjacent to freeways.



Figure 4-8 Distinct Communities



<sup>a</sup> Interstate 10   <sup>b</sup> National Register of Historic Places   <sup>c</sup> Gila River Indian Community

The Study Area has communities with distinct characteristics and cohesion.



daily traffic correlates to a need for 55 additional lanes of arterial street capacity in the Study Area. Without the proposed action, the region will suffer even greater congestion, travel delays, and limited options for moving people and goods safely through the Phoenix metropolitan region. This congestion would affect low-income residents who have a much greater reliance on public transportation and, in particular, on local buses that travel on arterial streets. This, in turn, could affect the character of the individual villages and distinct subareas in the Study Area. The area's growth prospects as envisioned by the municipalities' long-range plans, as well as their contributions to regional economic growth, could also be adversely affected by both the perception and reality of traffic congestion and travel delays.

## MITIGATION

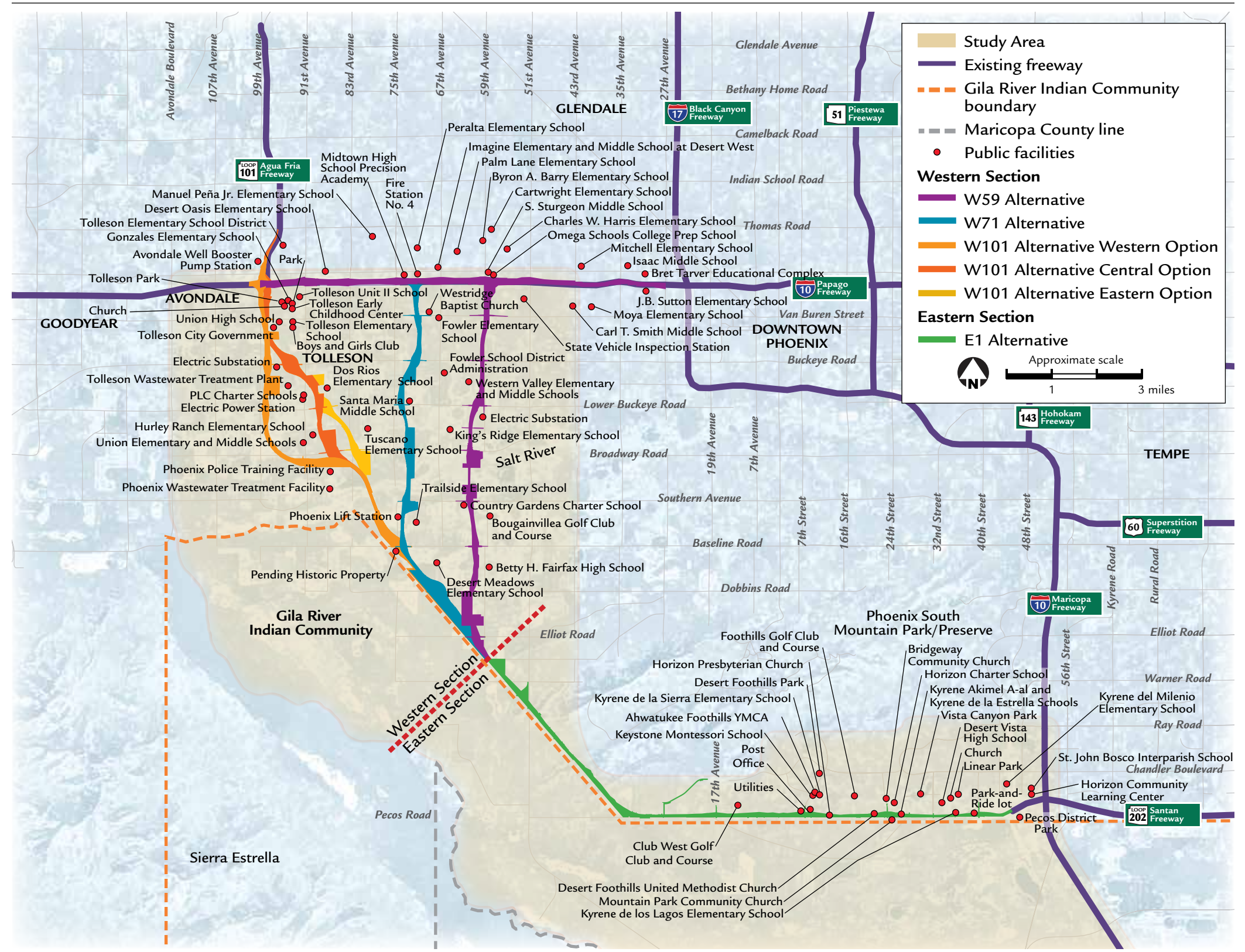
Potential mitigation measures for social conditions-related impacts (e.g., visual and audible intrusions) are discussed in the sections, *Land Use* (beginning on page 4-3), *Displacements and Relocations* (beginning on page 4-46), *Economic Impacts* (beginning on page 4-56), *Air Quality* (beginning on page 4-68), *Noise* (beginning on page 4-88), *Cultural Resources* (beginning on page 4-140), *Prime and Unique Farmlands* (beginning on page 4-161), *Visual Resources* (beginning on page 4-167), and *Temporary Construction Impacts* (beginning on page 4-173), and in Chapter 5, *Section 4(f) Evaluation*. Parties responsible for implementing the potential mitigation measures are identified in those sections.

The following mitigation measures for the social effects of the proposed action are applicable to all action alternatives.

## ADOT Design Responsibilities

To reduce community intrusions caused by the action alternatives and reduce impacts on the character of surrounding communities, mitigation measures considered by ADOT during the design phase would include reducing the amount of R/W required; providing alternative access to the local road network to satisfy emergency services access requirements; and using noise barriers, aesthetic treatments of structures, and landscaping to reduce community intrusions (see the sections, *Noise* and *Visual*

### Figure 4-9 Public Facilities and Services



*Numerous public facilities are primarily in locations where development has intensified in recent years.*



**Table 4-9** Impacts on Community Character and Cohesion, Action Alternatives

| Alternative                | Location   | Land Use/<br>Community Characteristics   | Effect on Characteristics  | Effect on Community Cohesion   | Comments   |
|----------------------------|--|--|--|--|--|
| <b>Western Section</b>     |  |  |  |  |  |
| <b>W59<br/>Alternative</b> | <ul style="list-style-type: none"> <li>Western portion of Laveen Village south of the Salt River</li> </ul>              | <ul style="list-style-type: none"> <li>North of South Mountain Avenue, remains in agricultural use, in contrast to areas farther east and west that have largely been converted to single-family residential</li> </ul>  | <ul style="list-style-type: none"> <li>Would visually and audibly intrude on the less-intensive, passive residential character of the area</li> </ul>  | <ul style="list-style-type: none"> <li>No adverse effects on circulation in arterial street network, which would be maintained through planned interchanges at Southern Avenue and Elliot, Dobbins, and Baseline roads</li> <li>South of the Salt River, residential displacements would affect scattered rural parcels; a cluster of three of these residences occur in a census block with elderly populations (for definitions of populations see the section, <i>Environmental Justice and Title VI</i>, beginning on page 4-29); these rural residences are bordered to the north, south, and east by planned small-lot residential subdivisions, typical of development occurring throughout the area</li> </ul> | <ul style="list-style-type: none"> <li>W59 Alternative would pass through the Laveen Village core in the Dobbins Road vicinity using a similar alignment planned for previous versions of the South Mountain Freeway</li> </ul>  |
|                            | <ul style="list-style-type: none"> <li>Through Estrella Village, between the Salt River and Roosevelt Canal</li> </ul>   | <ul style="list-style-type: none"> <li>Primarily agricultural areas with the exception of an area just north of Broadway Road where the action alternative would pass between two housing developments on land set aside to accommodate previous versions of the South Mountain Freeway</li> </ul> |  | <ul style="list-style-type: none"> <li>No adverse effects on circulation in arterial street network, which would be maintained through planned interchanges at Broadway, Lower Buckeye, and Buckeye roads</li> <li>Would displace residences within the Rio Del Rey subdivision, an area of census blocks that contain minority populations</li> </ul>   | <ul style="list-style-type: none"> <li>None of the Rio Del Rey subdivision's loop or cul-de-sac streets are intended to be connected across the potential freeway expanse</li> <li>Service traffic interchange at Broadway Road would disrupt the edge of adjacent neighborhood streets but would not alter any of the main ingress/egress points</li> </ul> |
|                            | <ul style="list-style-type: none"> <li>North of the Roosevelt Canal between Buckeye Road and Van Buren Street</li> </ul> | <ul style="list-style-type: none"> <li>Primarily industrial, with agricultural land and a mix of business park, light industrial, and heavier industrial uses (toward Van Buren Street)</li> </ul>   | <ul style="list-style-type: none"> <li>Would not alter the existing character</li> </ul>   | <ul style="list-style-type: none"> <li>Internal site circulation and parking/storage areas would be disrupted where the action alternative would bisect developed properties</li> <li>No adverse effects on circulation in arterial street network, which would be maintained through planned interchanges at Lower Buckeye Road and Van Buren Street</li> </ul>   | <ul style="list-style-type: none"> <li>W59 Alternative would pass through the Estrella Village core in the Lower Buckeye Road vicinity using a similar alignment planned for previous proposals for a South Mountain Freeway</li> <li>Internal residential road network would be reconfigured</li> </ul>   |
|                            | <ul style="list-style-type: none"> <li>North of Van Buren Street to I-10<sup>a</sup> (Papago Freeway)</li> </ul>         | <ul style="list-style-type: none"> <li>Industrial uses and single-family and multifamily residential uses</li> </ul>   | <ul style="list-style-type: none"> <li>Would visually and audibly intrude on the less-intensive, passive, single-family residential character of the area west of the alternative and would displace residents of apartment complexes to the east</li> </ul> | <ul style="list-style-type: none"> <li>Would displace residents from the Liberty Cove and Southwest Village apartments, as well as 28 residences within the Patio Homes West subdivision, located in census units that contain both minority and low-income populations</li> </ul>   | <ul style="list-style-type: none"> <li>W59 Alternative would pass over Roosevelt Street</li> </ul>   |
| <b>W71<br/>Alternative</b> | <ul style="list-style-type: none"> <li>Elliot Road to just north of Dobbins Road (Laveen Conveyance Channel)</li> </ul>  | <ul style="list-style-type: none"> <li>Area is split between portions that are primarily in agricultural use or largely undeveloped</li> </ul>   | <ul style="list-style-type: none"> <li>Would visually and audibly intrude on the less-intensive, passive residential character of the area not yet rapidly urbanizing</li> </ul>   | <ul style="list-style-type: none"> <li>No adverse effects on circulation in arterial street network, which would be maintained through planned interchanges at Southern Avenue and Elliot, Dobbins, and Baseline roads</li> </ul>  | <ul style="list-style-type: none"> <li>Because the general area is in transition, W71 Alternative would be a part of the evolving land use plan</li> </ul>   |

Note: Other societal impacts regarding air quality, noise, displacements, and community economics are presented in later sections of this chapter.

(continued on next page)

<sup>a</sup> Interstate 10



Table 4-9 Impacts on Community Character and Cohesion, Action Alternatives (continued)

| Alternative         | Location  | Land Use/<br>Community Characteristics  | Effect on Characteristics  | Effect on Community Cohesion  | Comments  |
|---------------------|---|---|--|---|---|
| Western Section     |   |   |  |   |   |
| W71<br>Alternative  | <ul style="list-style-type: none"><li>North of Dobbins Road to the Salt River</li></ul>                               | <ul style="list-style-type: none"><li>Land largely developed with homogeneous residential and industrial uses along the Salt River</li></ul>                          | <ul style="list-style-type: none"><li>Would visually and audibly intrude on the less-intensive, passive residential character of the area not yet rapidly urbanizing</li></ul> | <ul style="list-style-type: none"><li>Would affect the established Laveen Meadows and Laveen Ranch subdivisions, located in census blocks that contain minority populations, resulting in displacements; remaining homes west of the alternative would be separated from the larger subdivision</li><li>No adverse effects to circulation on arterial street network, which would be maintained through planned interchanges at Southern Avenue and Elliot, Dobbins, and Baseline roads</li></ul>   | <ul style="list-style-type: none"><li>Internal residential road network would be reconfigured</li></ul> |
|                     | <ul style="list-style-type: none"><li>North of the Salt River to Buckeye Road in Estrella Village</li></ul>           | <ul style="list-style-type: none"><li>Land transitioning from primarily agricultural uses to homogeneous residential developments</li></ul>                           |  | <ul style="list-style-type: none"><li>Would displace residents in the rural, low-density Western Heritage Estates subdivision; would divide the Sienna Vista Manor subdivision, resulting in displacements; would cause displacements in neighboring Estrella Village subdivision located in census blocks that contain minority populations (replacement housing for the rural residences would be difficult to acquire because that type of housing is not being built at the rate of small-lot subdivisions)</li><li>No adverse effects on circulation in arterial street network, which would be maintained through planned interchanges at Broadway, Lower Buckeye, and Buckeye roads</li><li>W71 Alternative was adjusted to avoid passing through the Santa Maria community just south of Buckeye Road</li></ul> |   |
|                     | <ul style="list-style-type: none"><li>North of Buckeye Road to I-10 (Papago Freeway) in Estrella Village</li></ul>    | <ul style="list-style-type: none"><li>Primarily industrial uses with “pockets” of agricultural uses; established residential uses north of Van Buren Street</li></ul> | <ul style="list-style-type: none"><li>Would not alter the existing community character but would visually and audibly intrude on the established residential use</li></ul>     | <ul style="list-style-type: none"><li>No adverse effects on circulation in arterial street network, which would be maintained through planned interchanges at Buckeye Road and Van Buren Street</li><li>Would displace residences in the Westbridge Park subdivision, located in census blocks that contain minority populations</li></ul>  |   |
| W101<br>Alternative | <ul style="list-style-type: none"><li>Elliot Road to just north of Dobbins Road (Laveen Conveyance Channel)</li></ul> | Same as described for the W71 Alternative   |  |   |   |
|                     | <ul style="list-style-type: none"><li>North of Dobbins Road to the Salt River</li></ul>                               | <ul style="list-style-type: none"><li>Land developing with homogeneous residential uses and existing low-density residential uses along the Salt River</li></ul>      | <ul style="list-style-type: none"><li>Would visually and audibly intrude on the less-intensive, passive residential character of the area</li></ul>                            | <ul style="list-style-type: none"><li>Would cause displacements in the developing Laveen Farms subdivision that includes census blocks containing minority populations</li><li>No adverse effects on circulation on arterial street network, which would be maintained through planned interchanges at Southern Avenue and Elliot, Dobbins, and Baseline roads</li></ul>  | <ul style="list-style-type: none"><li>Internal residential road network would be reconfigured</li></ul> |

(continued on next page)

Table 4-9 Impacts on Community Character and Cohesion, Action Alternatives (continued)

| Alternative         | Location  | Land Use/<br>Community Characteristics  | Effect on Characteristics   | Effect on Community Cohesion  | Comments  |
|---------------------|---|---|---|---|---|
| Western Section     |   |   |   |   |   |
| W101<br>Alternative | • Salt River to Lower Buckeye Road (western area of Estrella Village) | • Land transitioning from primarily agricultural uses to homogeneous residential developments   | • Would visually and audibly intrude on the less-intensive, passive residential character of the area             | <ul style="list-style-type: none"><li>• Eastern Option would cause displacements in the developing Tuscano subdivision and divide the existing 83rd Avenue and Lower Buckeye Road subdivision, both of which are located in census blocks that contain minority populations</li><li>• Central Option would affect existing agricultural and dairy operations south of Broadway Road and the developing Hurley Ranch subdivision, located in census blocks that contain minority populations</li><li>• Western Option would affect existing agricultural and dairy operations south of Broadway Road and the existing Country Place subdivision that includes census blocks that contain minority populations</li><li>• No adverse effects on circulation in arterial street network, which would be maintained through planned interchange at or near Broadway Road</li></ul> | <ul style="list-style-type: none"><li>• Dairy operations are spread along Broadway Road between 83rd and 99th avenues. The Eastern Option would avoid the dairy area. The Western Option would pass through several such properties. The Central Option would go through the center of this dairy cluster. The dairy operations have been at this location for many years; a W101 Alternative would introduce a barrier amid this cluster of common economic and agricultural activity.</li><li>• Internal residential road network would be reconfigured</li></ul> |
|                     | • Lower Buckeye Road to Buckeye Road                                  | • Land transitioning from primarily agricultural uses to homogeneous residential developments and retail businesses   | • Would visually and audibly intrude on the less-intensive, passive, developing residential character of the area | <ul style="list-style-type: none"><li>• Eastern Option would cause displacements in the Heritage Point and Farmington Park subdivisions that includes census blocks that contain minority populations</li><li>• Central Option would cause displacements in the Farmington Park subdivision that includes census blocks that contain minority populations</li><li>• Western Option would disrupt the large retail plaza at northeastern corner of Lower Buckeye Road and 99th Avenue</li><li>• No adverse effects on circulation in arterial street network, which would be maintained through planned interchanges at Lower Buckeye and Buckeye roads</li></ul>  | <ul style="list-style-type: none"><li>• Internal residential road network would be reconfigured</li><li>• Central and Eastern Options would affect access to Dos Rios Elementary School and a planned public neighborhood park located along 87th Avenue; however, access would not be entirely eliminated for these properties</li></ul>   |
|                     | • Buckeye Road to I-10 (Papago Freeway)                               | <ul style="list-style-type: none"><li>• Primarily industrial and warehouse/distribution north of Buckeye Road to Van Buren Street</li><li>• Van Buren Street to I-10 (Papago Freeway), primarily agricultural use transitioning to commercial (e.g., automobile sales and truck stop/convenience centers)</li></ul> | • Would not alter the existing character  | • No adverse effects; circulation on arterial street network would be maintained through planned interchanges at Buckeye Road and Van Buren Street  | • Tolleson's downtown core, older established neighborhoods, and main civic and educational facilities would be east of the W101 Alternative and Options. All options would avoid the city's core area. The community's character would, however, still be adversely affected by the introduction of a freeway nearby. Its tax base would also be adversely affected by the freeway, affecting services (see the section, <i>Economic Impacts</i> , beginning on page 4-56).  |

(continued on next page)



Table 4-9 Impacts on Community Character and Cohesion, Action Alternatives (continued)

| Alternative     | Location  | Land Use/<br>Community Characteristics   | Effect on Characteristics   | Effect on Community Cohesion   | Comments  |
|-----------------|---|--|---|--|---|
| Eastern Section |   |  |   |  |   |
| E1 Alternative  | <ul style="list-style-type: none"><li>I-10 (Maricopa Freeway) to approximately 35th Avenue alignment along the nearly built-out Ahwatukee Foothills Village</li></ul> | <ul style="list-style-type: none"><li>Established community to the north characterized by homogeneous residential communities with scattered commercial and public/quasi-public uses</li><li>Vacant and agricultural uses on Community<sup>b</sup> land to the south</li></ul> | <ul style="list-style-type: none"><li>Would visually and audibly intrude on the less-intensive, passive, residential character of the area. The magnitude of impact would be offset by the fact the alternative would replace the existing four-lane Pecos Road. Pecos Road, although to a lesser degree than would occur with the action alternative, now visually and audibly intrudes on the village. Further, the impact would not be “new” to the village, considering that I-10 and the I-10/SR 202L<sup>c</sup>/Pecos Road system traffic interchange border the village on the east and that either or both are used regularly by village residents.</li><li>The alternative would be on the village’s outskirts by replacing Pecos Road as planned and approved by the State Transportation Board in 1988. By staying on the village’s perimeter, village residents’ internal mobility, established sense of place, feeling of inclusion, and internal continuity would not be substantially altered (Figure 4-8). The E1 Alternative would eliminate access to Pecos Road (which would itself be eliminated). New traffic patterns would, thus, evolve for local traffic, disrupting existing networks that use Pecos Road as an arterial street.</li></ul> | <ul style="list-style-type: none"><li>No adverse effects on circulation in arterial street network, which would be maintained through planned interchanges at 17th Avenue, Desert Foothills Parkway, and 24th and 40th streets</li><li>The E1 Alternative would alter existing access to the Valley Metro 40th Street/Pecos Road Park-and-Ride facility; however, the facility was:<ul style="list-style-type: none"><li>designed to accommodate access modification if necessary for freeway construction and/or operation</li><li>placed at its location specifically to facilitate access to the proposed freeway, once in operation</li></ul></li></ul>                    | <ul style="list-style-type: none"><li>Pecos Park, a regional park south of Pecos Road and north of the Community boundary, would be compatible with the action alternative</li><li>Pecos Park uses are neither noise- nor visually sensitive</li><li>Park is adjacent to an existing freeway segment [see Chapter 5, <i>Section 4(f) Evaluation</i>, for more information]</li><li>Kyrene de los Lagos Elementary School, located between 40th and 32nd streets, has access directly onto Pecos Road; that access would be eliminated as a result of the action alternative. However, the school’s main access point is off Liberty Lane. Further, school siting records indicate district officials preferred the school’s existing location because of the future access that would eventually be provided by the proposed freeway.</li><li>Mountain Park Community Church would be displaced</li><li>Internal residential road network would be reconfigured</li><li>Proposed extension of Chandler Boulevard from 27th Avenue alignment east 1 mile to the road’s current western terminus would provide residents of Foothills Reserve subdivision a second point of access/egress</li></ul> |
|                 | <ul style="list-style-type: none"><li>35th Avenue alignment to Elliot Road</li></ul>  | <ul style="list-style-type: none"><li>Primarily natural land with pockets of single-family residential uses (the Dusty Lane community)</li><li>Primarily vacant and agricultural uses on Community land to the south and west and a casino, a commercial land use</li></ul>    | <ul style="list-style-type: none"><li>Would visually and audibly intrude on the comparatively less-intensive, passive, natural, and sparsely developed residential character of the area</li></ul>  | <ul style="list-style-type: none"><li>No adverse effects on circulation in arterial street network, which would be maintained through access to the Dusty Lane community from Dusty Lane and an interchange at 51st Avenue</li><li>Action alternative would impede access to the South Mountains from the Community (see the section, <i>Cultural Resources</i>, beginning on page 4-140, regarding the importance of the South Mountains to the Community)</li><li>Would displace residences in the Dusty Lane area, some of which are located in census blocks containing minority and elderly groups, and in a census block group containing disabled populations</li></ul> | <ul style="list-style-type: none"><li>Chapter 5, <i>Section 4(f) Evaluation</i>, presents a detailed discussion of the interaction between the proposed action and the South Mountains.</li></ul>   |

<sup>b</sup> Gila River Indian Community    <sup>c</sup> State Route 202L (Loop 202)

*Resources*, beginning on pages 4-88 and 4-167, respectively, to learn more about mitigation).

The following are examples of design mitigation:

- encasement of existing facilities for the Sprint fiber-optic line
- a structure over Lower Buckeye Road (to reduce impacts on the Sprint fiber-optic line)
- a longer structure over the Roosevelt Canal (to alleviate impacts on the AT&T fiber-optic line)

The ADOT Right-of-Way Group would coordinate during the design phase to designate necessary utility corridors for relocations where appropriate (see the section, *Temporary Construction Impacts*, beginning on page 4-173, to learn more about utility-related mitigation).

ADOT would coordinate with all local agencies and private facility owners to minimize the effects of utility relocations and adjustments. Coordination would include, when possible, developing construction schedules to coincide with scheduled maintenance periods and off-peak loads.

ADOT would coordinate with appropriate City of Phoenix officials during the final design process to consider and identify, if appropriate, enhancements such as a pedestrian overpass to reduce possible pedestrian-related impacts. During that process, if mitigation is warranted, the operations, maintenance, and liabilities of the facilities would be passed on to the local jurisdictions.

During the design phase, ADOT would coordinate with municipalities and affected communities to address and resolve impacts on internal road networks. Each action alternative would affect the configuration of the existing local street network. Reconfiguration would be subject to modification as design of the project is refined in future project development phases. An example of how the local street network could be reconfigured is shown in Figures 3-32 and 3-33 (see pages 3-56 and 3-57) using the W59 and E1 Alternatives.

ADOT would develop and implement a public involvement plan for the design and construction phases of the proposed action. Objectives of continued public

involvement may include, but would not be limited to, a level of involvement in:

- architectural design treatment of structures
- measures to minimize harm to Section 4(f) resources
- the acquisition and relocation process
- modification to the local roadway network
- construction activity monitoring

During the design and construction phases of the selected action alternative, ADOT would coordinate with all appropriate emergency services, and efforts would be made to minimize effects on response routes and times for all service areas.

**ADOT District Responsibilities**

Mitigation for societal impacts would include continuous public communication efforts during the design and construction phases as well as implementation of an acquisition and relocation program (see the section, *Displacements and Relocations*, beginning on page 4-46).

ADOT would coordinate with all local agencies and private facility owners to minimize the effects of utility relocations and adjustments. Coordination would include, when possible, developing construction schedules to coincide with scheduled maintenance periods and off-peak loads.

During construction, ADOT would coordinate with the affected utilities to minimize disruption of service.

**CONCLUSIONS**

The action alternatives would introduce an intensive transportation use adjacent to less-intensive, less-compatible uses. Primarily, the existing character of neighboring communities would be adversely affected by the physical presence of the proposed freeway and its associated visual and noise intrusions into nearby neighborhoods.

In the Western Section, the largely transitional character from agricultural to homogeneous residential and commercial uses has been planned for several years (see the section, *Zoning*, on page 4-17); land use types and distribution as envisioned by municipalities’ general plans have remained relatively unchanged since the early 1980s.

Implementation of any of the action alternatives would be only one of several factors that could alter the rate of the ongoing transition, and none would induce alteration of the ultimate land use types from those envisioned in the respective general plans. Considering construction time frames, it is more likely that much of the area in the Western Section already will have transitioned before the entire proposed freeway would become operational. Of the three action alternatives in the Western Section, implementation of the W59 (Preferred) Alternative would least affect social conditions, as defined in this section.

In the Eastern Section, the E1 (Preferred) Alternative (from I-10 [Maricopa Freeway] to approximately 35th Avenue) would not substantially alter the character of nearly built-out Ahwatukee Foothills Village for reasons presented in Table 4-9. Because the proposed freeway would be on the village “outskirts” and would replace the existing four-lane Pecos Road (an action planned and approved by the State Transportation Board in 1988), there would be no adverse effects on Ahwatukee Foothills Village’s internal mobility, established sense of place, feeling of inclusion, and internal continuity. Mitigation measures would aid in reducing intrusion impacts caused by implementation of the action alternative. The E1 Alternative would introduce an intensive transportation use adjacent to a “serene” setting in a remote, peripheral portion of SMPP. Visual and noise intrusions on SMPP would be more severe than those encountered by village residents because of the park/preserve’s passive, pleasant, and natural setting.

While identification of the No-Action Alternative as the Selected Alternative would not affect community character and cohesion in the manner the action alternatives would, increased congestion on the local street network resulting from continued urbanization would lead to reduced efficiency in the delivery of services and in the movement of goods and people. The ability to complete the planned and approved Regional Freeway and Highway System is arguably being outpaced by growth in the region. This condition would likely continue to lead to substantial congestion on the local arterial street network as well as on the Regional Freeway and Highway System.



ENVIRONMENTAL JUSTICE AND TITLE VI

ENVIRONMENTAL JUSTICE

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, signed by the President on February 11, 1994, directs federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law. The U.S. Environmental Protection Agency (EPA) and FHWA define environmental justice as “fair treatment for people of all races, cultures, and incomes, regarding the development of environmental laws, regulations, and policies.” Environmental justice principles and procedures are followed to improve all levels of transportation decision making. The U.S. Department of Transportation (USDOT) Order 5610.2(a) requires that environmental justice principles be considered in all the Department’s programs, policies, and activities.

According to FHWA Order 6640.23A, three fundamental environmental justice principles apply to the transportation project development process:

- to avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations
- to ensure the full and fair participation by all potentially affected communities in the transportation decision-making process
- to prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations

Effective transportation decision making depends on understanding and properly addressing the unique needs of different socioeconomic groups. Properly implemented, environmental justice principles and procedures improve all levels of transportation decision making. The approach will:

- make better transportation decisions that meet the needs of all people
- design transportation facilities that fit more harmoniously into neighborhoods
- provide opportunities for neighborhood input in the process, including identifying potential effects and mitigation measures in consultation with affected neighborhoods and improving accessibility to public meetings, official documents, and notices to affected neighborhoods
- improve data collection, monitoring, and analysis tools that assess the needs of, and analyze the potential impacts on, minority and low-income populations
- avoid disproportionately high and adverse impacts on minority and low-income populations
- minimize and/or mitigate unavoidable impacts by identifying concerns early in the planning phase and providing offsetting initiatives and enhancement measures to benefit affected neighborhoods

Environmental justice populations include concentrations of minority, low-income, elderly, disabled, and female head-of-household populations (ADOT 2012b). A minority individual is defined as Black or African American, Hispanic, Asian American, American Indian/Alaskan Native, and Native Hawaiian or Pacific Islander. A member of a low-income population is defined as “a person whose household income is at or below the Department of Health and Human Services poverty guidelines.” The U.S. Department of Health and Human Services poverty guidelines state that the poverty income level for a family of four in 2013 was \$23,550. A geographic area is considered to have a minority or low-income population if more than 50 percent of its population meets the above minority or low-income definitions or if its minority or low-income population percentage is meaningfully greater in the affected area than is that for the general population.

Data Assumptions

To establish whether the proposed action would disproportionately affect environmental justice populations, a basis for comparison was established. Because the proposed action would affect multiple jurisdictions, all within Maricopa County, the county was identified as the area of comparison.

Environmental justice populations were identified as those populations in census geographies where the percentage of the environmental justice population is known to exceed the percentage of an “identifiable group,” in accordance with EPA guidance (EPA 1998). This study used a lower threshold for the identifiable group by determining the lesser of either 1½ times the area of comparison (Maricopa County) or 50 percent of the total population in the census geography.

The demographic information used in this analysis is from the 2010 U.S. Census, with the exception of disabled, which is based on data from the 2000 U.S. Census, according to ADOT guidance (ADOT 2012b).

To focus on potentially affected neighborhoods, the smallest unit of analysis for each of the studied populations was identified. Census block-level data were used to identify minority, elderly, and female head-of-household populations. Census block group-level data were used to identify disabled populations. Census tract-level data were used to identify low-income populations.

Affected Environment

Affected Populations

The percentages of environmental justice populations for the Study Area, affected jurisdictions, Maricopa County, and the state of Arizona are shown in Table 4-10.

Data in Table 4-10 illustrate the social diversity in the Study Area. Compared with Maricopa County as a whole, the Study Area has a greater percentage of all of the sensitive populations discussed, except for disabled and elderly populations. The portion of minorities in the Study Area (68 percent), is 27 percentage points

Table 4-10 Environmental Justice Population Percentages, Affected Study Area Jurisdictions

| Population                                | State of Arizona | Maricopa County | Gila River Indian Community | City of Avondale | City of Chandler | City of Glendale | City of Goodyear | City of Phoenix | City of Tolleson | Study Area |
|---|------------------|-----------------|-----------------------------|------------------|------------------|------------------|------------------|-----------------|------------------|------------|
| Minority                                  | 42.1             | 41.4            | 98.8                        | 65.9             | 38.3             | 48.4             | 41.7             | 53.4            | 89.2             | 68.1       |
| Hispanic or Latino <sup>a</sup>           | 29.6             | 29.6            | 15.3                        | 50.3             | 21.9             | 35.5             | 27.8             | 40.8            | 80.1             | 51.3       |
| Black or African American                 | 3.7              | 4.6             | 0.3                         | 8.7              | 4.5              | 5.6              | 6.3              | 6.0             | 5.8              | 8.4        |
| American Indian or Alaskan Native         | 4.0              | 1.6             | 81.4                        | 1.0              | 1.1              | 1.2              | 1.0              | 1.6             | 1.0              | 2.2        |
| Asian                                     | 2.7              | 3.4             | 0                           | 3.3              | 8.1              | 3.8              | 4.2              | 3.0             | 0.8              | 4.0        |
| Native Hawaiian or Other Pacific Islander | 0.2              | 0.2             | 0.1                         | 0.3              | 0.2              | 0.2              | 0.1              | 0.1             | 0.2              | 0.2        |
| Some other race                           | 0.1              | 0.1             | 0                           | 0.2              | 0.2              | 0.1              | 0.1              | 0.2             | 0.2              | 0.2        |
| More than one race                        | 1.8              | 1.9             | 1.7                         | 2.1              | 2.3              | 2.0              | 2.2              | 1.7             | 1.1              | 1.8        |
| Low-income <sup>b</sup>                   | 15.3             | 13.9            | 47.8                        | 13.6             | 7.1              | 16.3             | 7.8              | 18.8            | 18.0             | 15.5       |
| Disabled <sup>c</sup>                     | 19.3             | 18.0            | 25.7                        | 16.3             | 13.3             | 18.3             | 14.8             | 19.1            | 22.5             | 17.2       |
| Elderly <sup>d</sup>                      | 19.3             | 17.1            | 9.0                         | 8.8              | 12.2             | 13.9             | 16.4             | 12.8            | 12.5             | 7.7        |
| Female head-of-household <sup>e</sup>     | 7.1              | 7.3             | 18.3                        | 10.9             | 7.2              | 9.6              | 6.4              | 9.0             | 18.5             | 11.6       |

*Note:*Evaluations for all cities and Maricopa County were calculated by summing all the tracts with centroids in each municipal planning area and then calculating the percentage.  
*Sources:* State, county, city, tribal, and Study Area figures are based on 2010 data from the U.S. Census Bureau (2010a), with the exception of disabled, which is based older on data from the U.S. Census Bureau (2000), and low-income, which is based on the 5-year American Community Survey (2006–2010).  
<sup>a</sup> based on U.S. Census Table P5: Hispanic or Latino, and Not Hispanic or Latino by Race  
<sup>b</sup> based on U.S. Census, American Community Survey: Poverty Status in the Past 12 Months  
<sup>c</sup> based on U.S. Census 2000: Civilian Noninstitutionalized Persons Age of 5 and Over with Sensory, Physical, Mental, and/or Self-care Disabilities  
<sup>d</sup> based on U.S. Census: Sex by Age  
<sup>e</sup> based on U.S. Census: Household Size by Household Type by Presence of Own Children

higher than the county percentage (41 percent). The percentage of the Study Area population that is low-income (16 percent) is 2 percentage points higher than the percentage for the county (14 percent). The percentage of female heads-of-household with children (12 percent) is 5 percentage points higher than that of the county (7 percent). Figures 4-10 through 4-14 illustrate the geographic distribution in the Study Area of environmental justice populations.

Census blocks containing a percentage of minorities at or above 50 percent are distributed throughout the Study Area. Within the Study Area, the blocks with the greatest percentage of minority populations are located within ½ mile of I-10 (Papago Freeway) and within the Community. While minority populations are widely distributed in the Study Area, two communities, Santa Maria and Tolleson, bear further discussion (see Figure 4-8, on page 4-22, for community descriptions).

- Census blocks that make up the Santa Maria community have populations of between 76 and 100 percent minorities, mostly Hispanic. Additionally, a strong sense of community exists, as evidenced in the percentage of area residents who have lived in the same home since before 1995 (72 percent)—almost twice the corresponding figure for Maricopa County (37 percent) (U.S. Census Bureau 2010b).
- Overall, the city of Tolleson is 89 percent minority. In this largely Hispanic community (80 percent), Spanish is spoken in 70 percent of households, compared with Maricopa County, where 21 percent of households speak Spanish in the home (American Community Survey 2007–2011).

Low-income populations are less widely distributed in the Study Area than minority populations. The census

tracts with the greatest percentage of people living in poverty are located in the northern portion of the Study Area, concentrated around I-10 (Papago Freeway), east of 83rd Avenue. Many factors contribute to this concentration of low-income households, not the least of which is the availability of affordable housing in the Study Area. Within the Study Area, there is a higher percentage of multifamily housing units in the area immediately surrounding I-10, east of Tolleson. Most of the elementary school districts in the Western Section of the Study Area reported in 2009 that most students are eligible for free lunch, an indicator of lower incomes (the Arizona Department of Education National School Lunch Program determines eligibility for free lunches). Additionally, the U.S. Census Bureau’s Small Area Income and Poverty Estimates (2009) for school districts were considered.



Existing Trends Affecting Populations

The rural character of the Western Section of the Study Area is changing. Low-density residential and agricultural land uses are being supplanted by medium-density residential subdivisions. This planned change in land use presents challenges to minority and low-income populations:

- Agricultural uses have provided jobs for many minority farm workers.
- The growth is resulting in increased land values, making homes less affordable.

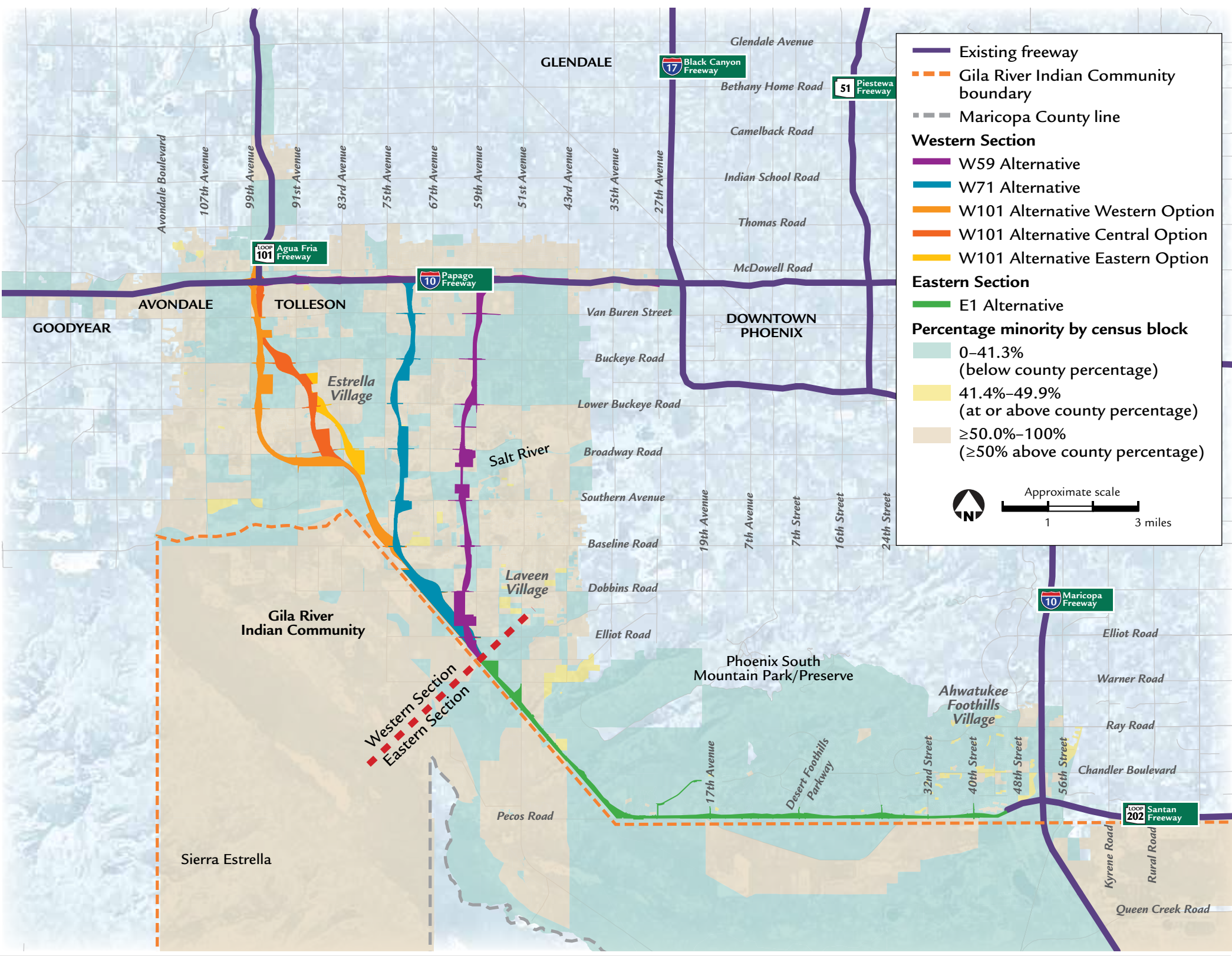
For most of the last decade, low-income residents faced rapidly increasing home prices. Because of the recent economic downturn, however, median single-family home prices in 2009 were comparable to home prices in 2000 (Arizona State University 2009). In 2004, areas such as South Phoenix and Tolleson, which at that time had median home prices below \$150,000, saw the biggest jumps in sales and prices. Rental prices also increased, although not as much during this period. The U.S. Department of Housing and Urban Development (HUD) reported that fair market rents for the Phoenix metropolitan area increased by 46 percent between 2000 and 2011 (HUD 2011).

Because of the greater percentage of low-income and minority populations in the Study Area relative to Maricopa County, local school districts, social outreach agencies, and aid organizations in the area were contacted to determine the social services provided to the area and the effects a major transportation corridor in the area might have. Social service agencies, such as shelters for the homeless, addiction treatment and recovery centers, soup kitchens, and public schools providing free meals, reported that most clients arrive in cars or by taxi or bus, or, in the case of low-income children receiving free meals at school, by school bus.

Environmental Consequences

Alternatives evaluated in the FEIS were identified through an iterative, multidisciplinary screening process of defining a range of reasonable alternatives that met the project purpose and need. All alternatives were designed to avoid, minimize, or mitigate

Figure 4-10 Minority Populations Distribution



Minority populations, as identified through the use of census data, are prevalent throughout much of the Study Area. The U.S. Census Bureau uses geographic areas that do not correspond with the boundaries of Phoenix South Mountain Park/Preserve (SMPP). While the map colors may suggest that people live in SMPP, in fact, the data are depicting adjacent areas.

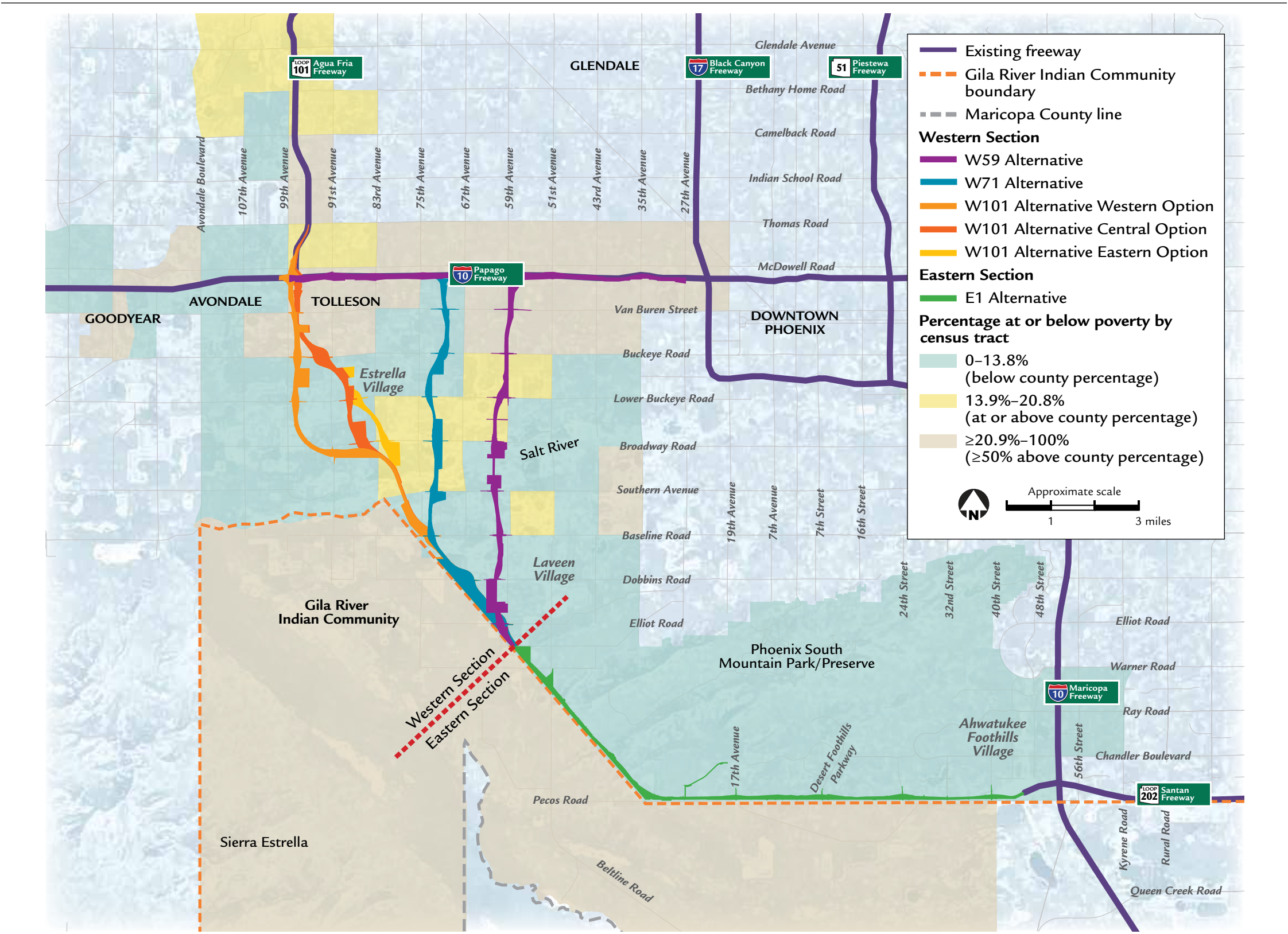


Engaging all populations in the EIS process for the proposed action

Public scoping is an integral part of identifying and analyzing environmental justice and Title VI impacts. Throughout the EIS process, early and continued communication with potentially affected neighborhoods ensured that neighborhood impacts would be identified and persons would not be overlooked or excluded from the process. Environmental justice and Title VI concerns have been addressed continuously since the start of the EIS process for the proposed action.

Specific strategies to ensure participation by Hispanic, Native American, and low-income populations were established at the outset. Specific activities to engage these populations in the process included multiple-language newsletters (Spanish and Native American), other printed materials available in Spanish, the availability of Spanish translators and team members at public meetings to facilitate comments, and direct and ongoing communication with Community members and tribal leaders. The SMCAT, with representation of minorities and both sexes, was convened early and met continuously through the completion of the impact analyses to provide input and guidance on the process. Chapter 2, *Gila River Indian Community Coordination*, and Chapter 6, *Comments and Coordination*, discuss specifics regarding the extent of engagement of all affected populations in the process.

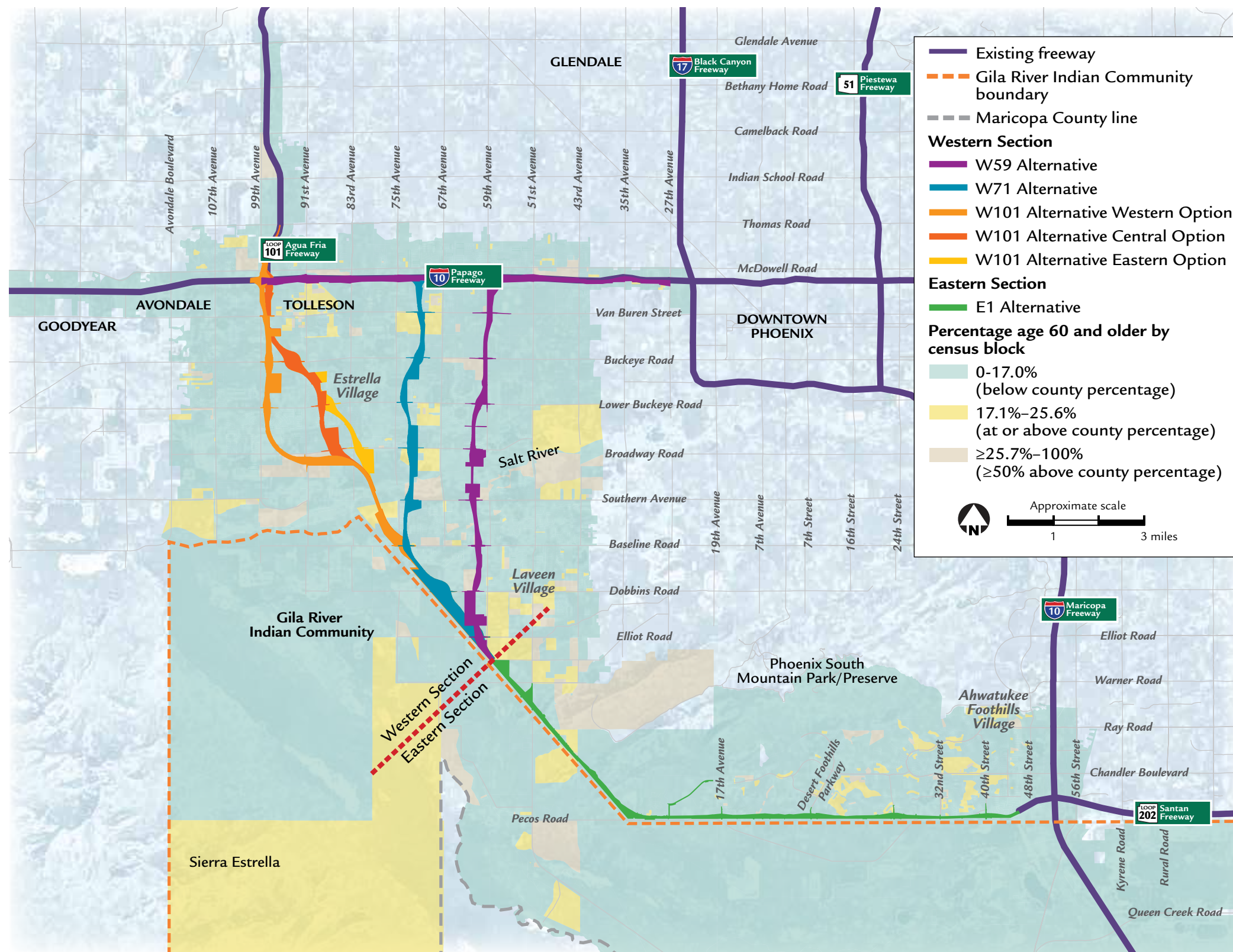
Figure 4-11 Low-income Populations Distribution



Low-income populations, as identified through the use of census tracts, are prevalent throughout much of the northern and northwestern portions of the Study Area. The U.S. Census Bureau uses geographic areas that do not correspond with the boundaries of Phoenix South Mountain Park/Preserve (SMPP). While the map colors may suggest that people live in SMPP, in fact, the data are depicting adjacent areas.



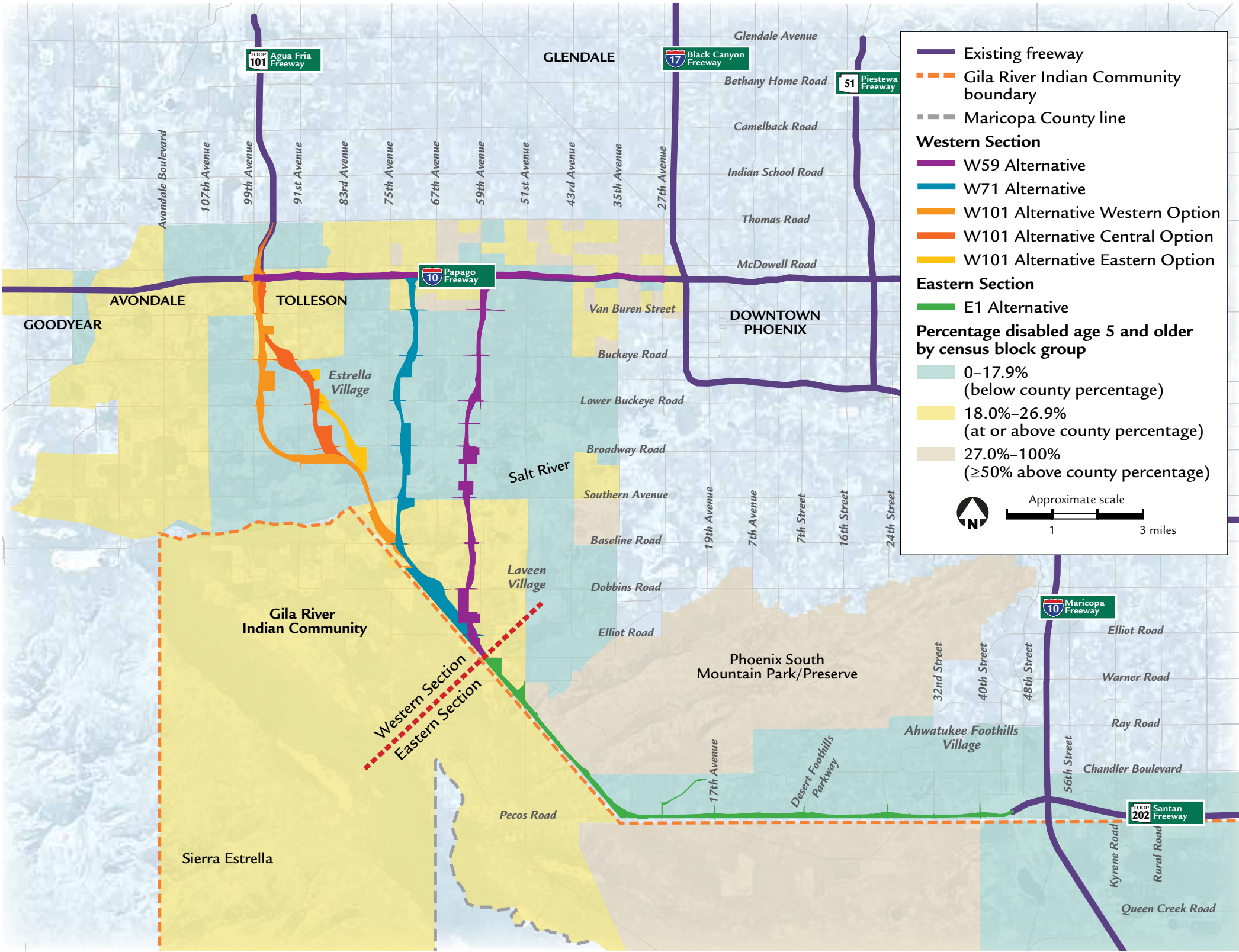
### Figure 4-12 Elderly Populations Distribution



*The majority of population segments in the Study Area fall below the overall county percentage of populations of people 60 years old and older. The U.S. Census Bureau uses geographic areas that do not correspond with the boundaries of Phoenix South Mountain Park/Preserve (SMPP). While the map colors may suggest that people live in SMPP, in fact, the data are depicting adjacent areas.*



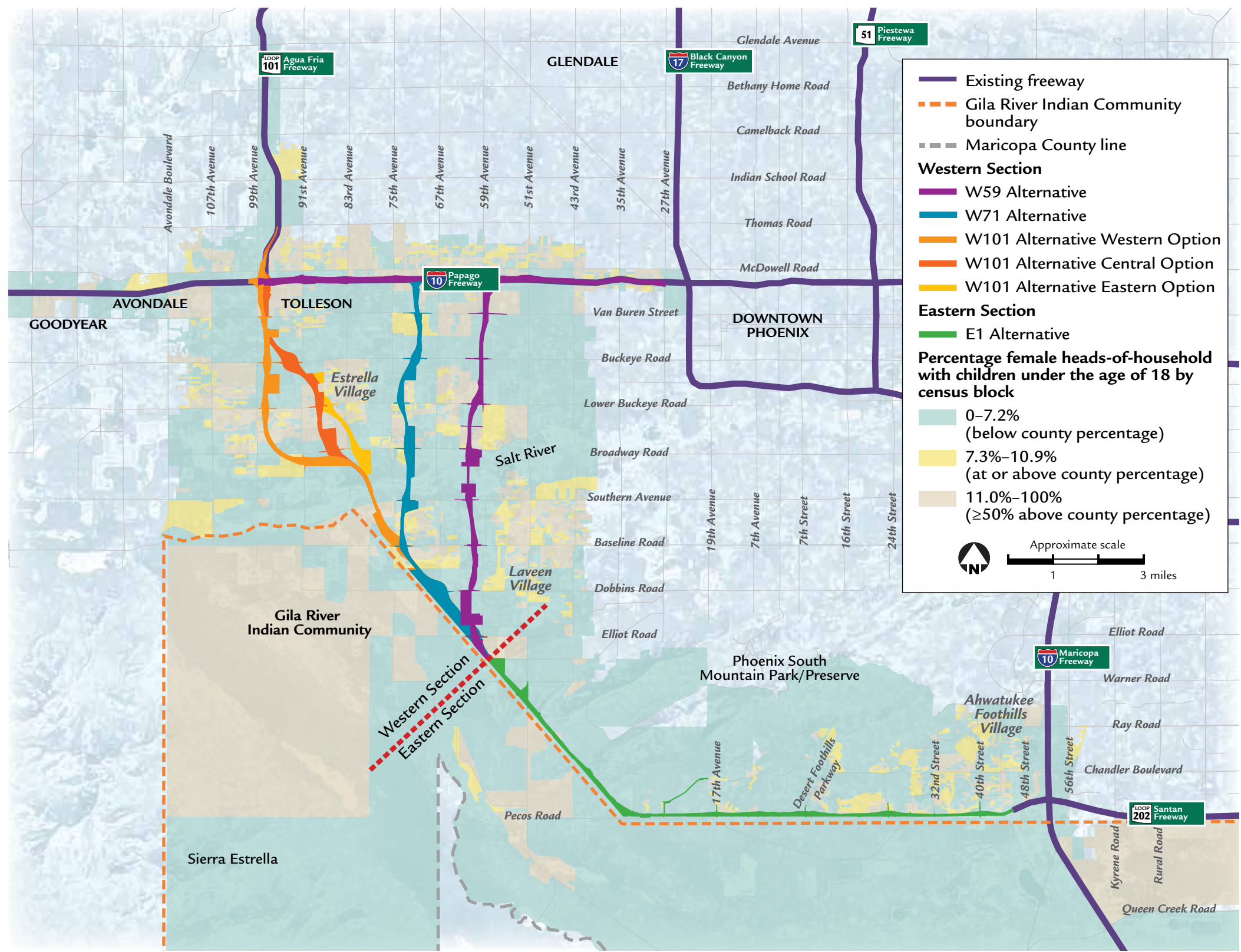
Figure 4-13 Disabled Populations Distribution



The U.S. Census Bureau uses geographic areas that do not correspond with the boundaries of Phoenix South Mountain Park/Preserve (SMPP). While the map colors may suggest that people live in SMPP, in fact, the data are depicting adjacent areas.



Figure 4-14 Female Head-of-household Populations Distribution



Populations with comparatively high percentages of female heads-of-household are found throughout the Study Area. The U.S. Census Bureau uses geographic areas that do not correspond with the boundaries of Phoenix South Mountain Park/Preserve (SMPP). While the map colors may suggest that people live in SMPP, in fact, the data are depicting adjacent areas.

disproportionately high and adverse human health and environmental effects on all populations, including environmental justice populations. Chapter 3, *Alternatives*, provides a description of the alternatives screening process during which such impacts were considered. As part of that process, specific alignment adjustments to the action alternatives were made to reduce or avoid certain adverse effects on environmental justice populations; they are discussed on page 5-4.

For comparison among alternatives, this portion of the environmental justice analysis focused on areas where there would be adverse environmental impacts, which includes all areas within the R/W footprint. Populations within census blocks or census block groups that would be affected by the action alternatives are shown in Table 4-11. This analysis identified environmental

justice populations as those census blocks, block groups, or tracts where the percentage of these groups is equal to or greater than 50 percent or 150 percent of the county percentage, whichever is less (in the case of minorities, the threshold is equal to or greater than 50 percent).

All action alternatives and options would affect residences using Section 8 housing vouchers. The HUD Section 8 housing assistance program is a rent subsidy program for eligible low-income families. (In general, the family’s income may not exceed 50 percent of the median income for the county or metropolitan area in which the family chooses to live.) The subsidies make up the difference between what a family can afford (usually 30 percent of household income) and the market rent for suitable housing (HUD 2000).

Specific impacts are described under the Western and Eastern Section action alternatives. All action alternatives and options would affect census blocks with minority populations greater than 50 percent because of displacements and relocations associated with the additional R/W needs for the proposed freeway. Replacement housing policy and guidance are addressed in the section, *Displacements and Relocations*, beginning on page 4-46.

Figures 4-10 through 4-14 support the findings presented in the discussion of impacts. Table 4-13 in the section, *Displacements and Relocations*, also supports the discussion.

All action alternatives would entail construction impacts that would affect all populations—environmental justice and otherwise. Such impacts would be temporary and would not cause undue hardship on any one population, and are spread amongst environmental justice populations as well as populations of predominantly higher income/lower minority populations.

Action Alternatives, Western Section

W59 (Preferred) Alternative

Nine of the 12 census blocks with residential displacements under the W59 Alternative contain 50 percent or greater minority populations. Of these 9 census blocks, impacts on 1 are common to all of the Western Section action alternatives. Six of the 9 minority population census blocks also contain a percentage of female head-of-household populations above the established threshold. The W59 Alternative would avoid impacts on minority populations within Tolleson and Santa Maria. The W59 Alternative would also avoid impacts on annual tax revenues of the Cities of Avondale and Tolleson; both communities contain greater than 50 percent minorities (66 percent and 89 percent, respectively).

Of the single-family residential displacements that would occur under the W59 Alternative, 28 displacements would occur in an established subdivision immediately adjacent to I-10, and 9 displacements would occur in the Rio Del Rey subdivision at Broadway Road and 63rd Avenue. Rio Del Rey is in the Riverside

Table 4-11 Environmental Justice Populations Affected by Action Alternatives

| Population  | Western Section |     |                     |                     |                     | Eastern Section |
|---|-----------------|-----|---------------------|---------------------|---------------------|-----------------|
|   | W59             | W71 | W101 Western Option | W101 Central Option | W101 Eastern Option | E1              |
| Census Block-level Data                                       |                 |     |                     |                     |                     |                 |
| Census blocks affected  | 99              | 104 | 105                 | 115                 | 131-132             | 52              |
| With no population <sup>a</sup>                               | 53              | 27  | 55                  | 59-60               | 59-60               | 23              |
| With impacts  | 12              | 56  | 37                  | 44                  | 52-53               | 10              |
| With minority populations ≥50% <sup>b</sup>                   | 9               | 51  | 32                  | 39                  | 47                  | 2               |
| With elderly populations ≥25.7% <sup>c</sup>                  | 2               | 0   | 1                   | 0                   | 0                   | 1               |
| With female head-of-household populations ≥11.0% <sup>d</sup> | 6               | 22  | 14                  | 23                  | 24                  | 2               |
| Census Block Group-level Data                                 |                 |     |                     |                     |                     |                 |
| 2000 Census block groups affected                             | 5               | 5   | 7-9                 | 9                   | 9                   | 15              |
| With impacts  | 4               | 5   | 2                   | 2                   | 3                   | 5               |
| With disabled ≥27% <sup>e</sup>                               | 1               | 1   | 0                   | 0                   | 0                   | 1               |
| Census Tract-level Data                                       |                 |     |                     |                     |                     |                 |
| 2010 Census tracts affected                                   | 9               | 7   | 10-11               | 11                  | 11                  | 10              |
| With impacts  | 5               | 5   | 3                   | 5                   | 6                   | 4               |
| With low-income ≥20.9% <sup>f</sup>                           | 2               | 0   | 0                   | 0                   | 0                   | 0               |

Sources: State, county, city, tribal, and Study Area figures are based on 2010 data from the U.S. Census Bureau (2010a), with the exception of disabled, which is based on older data from the U.S. Census Bureau (2000), and low-income, which is based on the 5-year American Community Survey (2006-2010).

<sup>a</sup> No population is those census blocks where the 2010 U.S. Census reported the population to be zero.  
<sup>b</sup> based on U.S. Census Table P5: Hispanic or Latino, and Not Hispanic or Latino by Race  
<sup>c</sup> based on U.S. Census Table P12: Sex by Age  
<sup>d</sup> based on U.S. Census Table P19: Household Size by Household Type by Presence of Own Children  
<sup>e</sup> based on U.S. Census Table P41: Civilian Noninstitutionalized Persons Age of 5 and Over with Sensory, Physical, Mental, and/or Self-care Disabilities  
<sup>f</sup> based on American Community Survey Table S1701: Poverty Status in the Past 12 Months



Elementary School District, which reported that a majority of its students are minorities, and 18 percent are low-income. The remaining 9 displacements caused by the W59 Alternative would be rural residential properties, primarily located south of the Salt River.

In addition to the single-family residential displacements, the W59 Alternative would displace two apartment complexes totaling up to 680 units. These apartments fall within a census block where greater than 50 percent of the population is minority. Most of the apartment units have “market-rate” rents; however, one apartment complex accepts Section 8 housing vouchers (of the 264 units in the complex, 16 currently use Section 8 vouchers). Even with these impacts, of the action alternatives in the Western Section, the W59 Alternative would displace the fewest residential properties.

### **W71 Alternative**

Of the 56 census blocks with residential displacements that would be caused by the W71 Alternative, 51 contain minority populations of 50 percent or greater than the census blocks’ total population. Twenty-two of these 56 blocks are also identified as having a percentage of female head-of-household populations above the established threshold.

Nearly half of the 705 single-family homes that would be affected by the W71 Alternative are within the Laveen Meadows, Laveen Ranch, and Laveen Farms subdivisions. These subdivisions are within the Laveen Elementary School District, where the local elementary school (Desert Meadows Elementary) reported that a majority of the students are minorities and 16 percent are low-income.

Another 252 single-family homes that would be affected by the W71 Alternative are homes within the Sienna Vista, Windsong, and Estrella Village subdivisions. These subdivisions consist largely of census blocks with greater than 50 percent minority populations and female heads of household with 11 percent or greater of the census blocks’ total population.

The W71 Alternative would purposefully avoid affecting the community of Santa Maria and Santa Maria Middle

School, located along Lower Buckeye Road. The W71 Alternative would also avoid impacts on annual tax revenues of the Cities of Avondale and Tolleson; both communities contain greater than 50 percent minorities (66 percent and 89 percent, respectively).

None of the five census tracts with residential displacements under the W71 Alternative would affect low-income populations. A census block group containing a disabled population would have 17 single-family residential displacements. This census block group is located between Van Buren Street and I-10. In addition, seven of the single-family residences within the W71 Alternative currently accept Section 8 housing vouchers.

### **W101 Alternative**

The options of the W101 Alternative would result in varying impacts on census blocks with minority populations representing 50 percent or greater of the census blocks’ total population. A number of these census blocks are common to all three options, while the W101 Alternative Eastern Option would affect the most census blocks with minority populations, and the Western Option would affect the fewest census blocks with minority populations. The options of the W101 Alternative would also result in varying effects on census blocks with female head-of-household populations with 11 percent or greater of the census blocks’ total population. Several of these census blocks are common to all three options, while the W101 Alternative Eastern Option would affect the most census blocks with female head-of-household populations and the Western Option would affect the fewest census blocks with female head-of-household populations.

The W101 Alternative Western Option would affect one census block with elderly populations greater than 150 percent of the county percentage, located within the Country Place subdivision.

### **Western Option**

The W101 Alternative Western Option would displace an additional 171 single-family homes in the

Country Place subdivision. This subdivision consists of census blocks with greater than 50 percent minority populations. An additional 3 residences using Section 8 housing vouchers would be affected.

### **Central Option**

The W101 Alternative Central Option would displace an additional 344 single-family homes in the 91st Avenue and Lower Buckeye Road and Hurley Ranch subdivisions, consisting almost entirely of census blocks with greater than 50 percent minority populations and female head-of-household populations with 11 percent or greater of the census blocks’ total population. An additional 9 residences using Section 8 housing vouchers would be affected by this option.

### **Eastern Option**

The W101 Alternative Eastern Option would displace an additional 430 single-family homes in the 91st Avenue and Lower Buckeye Road, Ryland at Heritage Point, 83rd Avenue and Lower Buckeye Road, and Hurley Ranch subdivisions, consisting almost entirely of census blocks with greater than 50 percent minority populations and female head-of-household populations with 11 percent or greater of the census blocks’ total population. These subdivisions are within the Union Elementary School District, which reported that a majority of students are minorities and 16 percent are low-income. An additional 11 residences using Section 8 housing vouchers would be affected by this option.

No residential displacements would occur in Tolleson as a result of the proposed action. Project-related disruptions in Tolleson would chiefly occur in industrial areas and would not adversely affect environmental justice populations in residential neighborhoods. The proposed action would not cut off access or restrict the mobility of environmental justice populations. Access to the high school would not be impaired. However, impacts on developed and developable commercial land in Tolleson would affect the City’s tax base, directly affecting the funding available to provide services to its largely minority population.

Action Alternative, Eastern Section

E1 (Preferred) Alternative

The E1 Alternative would result in 121 residential displacements. Two of the ten census blocks with residential displacements contain minority populations. Two affected census blocks contain female head-of-household populations greater than the threshold value; one of these census blocks is also identified as a minority block. One census block with residential impacts contains greater than the threshold for age 60 and over populations. Residential displacements would occur in one census block group containing an environmental justice population of people with disabilities. Most displacements resulting from the E1 Alternative would affect residences in census geographies where the percentage of each of the environmental justice populations is less than that of the Study Area as a whole. The section, *Context of Coordination in Relation to Environmental Justice Executive Order*, on page 2-11, acknowledges the efforts undertaken to engage the Community in the EIS process as further reflected throughout Chapter 2 and in appropriate sections of Chapters 3, 4, 5, and 6.

With regard to impacts on places of spiritual importance to certain population segments, such as the South Mountains Traditional Cultural Property (TCP), that raise potential environmental justice concerns with respect to Native American tribes, in particular, the Community, extensive consultation, avoidance alternatives analyses, and mitigation measures are discussed throughout the FEIS. While impacts on the South Mountains TCP would be substantial and unique in context, the direct conversion of lands to a transportation use would be limited to less than 0.2 percent of SMPP and would not prohibit ongoing access and the cultural and religious practices by Native American tribes. A sampling of engagement, avoidance analyses, and mitigation includes:

- The section, *Gila River Indian Community Coordination*, beginning on page 2-4, highlights the history of Community engagement throughout the EIS process.

- Content found on pages 4-143 and 4-144 illustrates meaningful engagement of the Community in that the “ ... Community has concurred with proposed mitigation of direct and indirect adverse impacts on the South Mountains TCP ... ”
- The section, *Mitigation*, beginning on page 4-158, presents several measures (e.g., multifunctional crossings, contributing element avoidance) to mitigate effects on cultural resources.
- The section, *Measures to Minimize Harm*, beginning on page 5-27, presents several measures to reduce effects on the South Mountains TCP and other cultural resources.

The beneficial and adverse effects on the overall population and on minority and low-income populations, in particular, were addressed under various sections of Chapters 4 and 5. The applicable sections of Chapter 4 include: *Land Use, Social Conditions, Displacements and Relocations, Economic Impacts, Air Quality, Noise, Water Resources, Biological Resources, Cultural Resources, Hazardous Materials*, and *Visual Resources*. In Chapter 5, the discussion of TCPs begins on page 5-26. Although the reader is referred to the individual sections for more detailed discussion of impacts on environmental justice populations, for convenience the environmental justice discussions have been combined in Table 4-12.

No-Action Alternative

Socioeconomic conditions under the No-Action Alternative would be similar to existing conditions. As discussed previously, rural land uses are being converted to urban uses throughout the Western Section of the Study Area. These changes have been planned; agricultural land uses are not shown on any of the Study Area’s affected municipalities’ future land use maps.

Congestion would increase with the No-Action Alternative, and accessibility to employment and housing might be impeded by increased congestion. As congestion on surface streets increases, all neighborhoods would be affected equally. Travel times for local buses would increase, affecting low-income and minority populations—according to the *2010-11 Valley Metro Transit On-Board Survey Report*, one-third

of Valley Metro bus riders are minority and more than half have annual household incomes below \$25,000. The No-Action Alternative would result in no property acquisitions and no household relocations. Therefore, environmental justice populations would not be affected by R/W acquisitions.

Participation of Affected Populations

Environmental justice communities were provided full access to the EIS process. As noted on page 1-4, three Native American communities, including the Gila River Indian Community, are members of MAG, the metropolitan planning organization for the area. The MAG metropolitan planning process also included outreach opportunities to environmental justice populations. In addition to involvement in MAG planning efforts, there were many targeted efforts to include members of environmental justice populations in the conduct of the EIS process. Chapter 6, *Comments and Coordination*, describes these efforts in detail and Chapter 2, *Gila River Indian Community Coordination*, describes the efforts to involve the Community. As discussed on page 2-9, Community members attended regular meetings of the SMCAT until 2006, when the Community requested all project-related communications take place at a government-to-government level.

As discussed beginning on page 2-1, extensive and ongoing coordination and communication has occurred with the Community. The direct interaction has led to project-related actions to avoid, minimize, and mitigate the effects of the action alternatives on the Community’s culture.

Access to the EIS process was provided for all population segments. Examples are:

- As discussed in Chapter 6, *Comments and Coordination*, extensive public outreach was accomplished, with numerous public scoping meetings held throughout the Study Area during the entire process. In all instances, when appropriate, access to these meetings was provided for all population segments. Public meetings were advertised in Spanish-language newspapers and



Table 4-12 Combined Discussion of Effects on Environmental Justice Populations

| Section of Chapter 4          | Potential Impacts  | Environmental Justice: Are there disproportionately high and adverse effects?   | Relevant FEIS <sup>a</sup> Text  |
|-------------------------------|--|---|--|
| Land Use                      | Action alternatives would convert existing and planned land uses to a transportation use.  | No. The percentages of conversion of residential, commercial, and other land uses that may be used by environmental justice populations are no greater than those used by other population segments in the Study Area.  | Chapter 2, <i>Gila River Indian Community Coordination</i> , and <i>Land Use</i> section beginning on page 4-3     |
|                               | Conversion of agricultural land to more urbanized uses would affect low-income and minority workers; the majority of farmworkers are foreign born, and nearly one-quarter of all farmworkers have family income levels below the national poverty guidelines (National Center for Farmworker Health 2012). | No. Agricultural practices would continue because conversion to a transportation use represents between 5 and 8 percent of the total agricultural lands in the Study Area. The loss of agricultural lands in the Study Area is more directly associated with urbanizing development as guided by local jurisdictions’ land use planning activities. Also, the use of agricultural lands for the proposed freeway was not a screening criterion; agricultural lands were not intentionally targeted for freeway purposes.  | <i>Land Use</i> section beginning on page 4-3  |
|                               | Conversion of two-tenths of a percent of the South Mountains to a transportation use would alter access to the mountains for traditional and religious practices by Native American communities.   | No. Use of the small portion of the South Mountains was unavoidable as outlined in Chapter 3, <i>Alternatives</i> , and in Chapter 5, <i>Section 4(f) Evaluation</i> . Measures to be implemented such as replacement lands, alternative access, and avoidance of religious features would not restrict continued traditional and religious practices.  | <i>Cultural Resources</i> section beginning on page 4-140 and Chapter 5, <i>Section 4(f)Evaluation</i>             |
| Social Conditions             | Increased road capacity would improve overall circulation and accessibility in the Study Area and the greater Phoenix metropolitan area, benefiting existing and future residents, employees, and employers.   | No. Environmental justice populations would benefit from reduced freeway travel times for individual vehicles and local buses. One-third of bus riders are minority and more than half have annual household incomes below \$25,000 (Valley Metro 2011). Improved access to school facilities and community centers that are used for after-school day care and recreational and educational activities would be available to all population segments.  | <i>Social Conditions</i> section beginning on page 4-20  |
|                               | Action alternatives would adversely alter character and/or cohesion of distinct communities known to include environmental justice populations in the Study Area.  | No. Character would not be altered, but proposed freeway would visually and audibly intrude on established uses. Cohesion would not be altered because adverse effects on circulation in the arterial street network would occur without the proposed project.  | Table 4-9, documenting specific impacts on individual neighborhoods  |
| Displacements and Relocations | Residential displacements of environmental justice populations would occur.  | No. Western Section action alternatives would displace residents in census blocks known to have environmental justice populations, but the majority of Western Section census blocks have such populations and avoidance would not be possible. However, when combined, the Western and Eastern Section alternatives would displace between 727 and 1,318 single- and multifamily residences, and the majority of such displacements would occur in census blocks not containing high percentages of environmental justice populations. The Preferred Alternative would displace the fewest residences in total when compared against residential displacements that would occur under the other action alternatives.                         | <i>Social Conditions and Displacements and Relocations</i> sections beginning on pages 4-20 and 4-46, respectively |
|                               | Displacements of businesses known to employ high percentages of environmental justice populations would occur.   | No. The Preferred Alternative would displace the greatest number of businesses when compared against business displacements that would occur under the other action alternatives. However, the displacement of the businesses does not represent disproportionately high and adverse effects because local businesses are regulated by State and federal laws prohibiting discriminatory hiring practices and because businesses would be afforded relocation opportunities within the Study Area.  | <i>Social Conditions and Displacements and Relocations</i> sections beginning on pages 4-20 and 4-46, respectively |
| Economic Impacts              | Conversion of tax-generating properties to a public transportation use would affect the public service responsibilities of affected jurisdictions.   | No. Impacts on the City of Tolleson would be adverse under the W101 Alternative and Options. The City’s total tax revenues would be reduced by 20 to 24 percent, potentially affecting the City’s ability to provide public services. These funds provide for important social and community services in Tolleson such as public safety, highways and streets, economic development, culture and recreation, and health and welfare. The City has a high percentage of environmental justice populations residing within its limits. However, the reduction in total tax revenues would be experienced by all population segments and the Preferred Alternative was identified, in part, to avoid the above-described impact (see page 3-68). | <i>Economic Impacts</i> section beginning on page 4-56   |
|                               | Modifications to travel times would affect population segments in the region.  | No. All population segments would substantially benefit from travel time savings and enhanced movement of goods and delivery of services. Travel time savings estimated through 2035 would range from \$3 billion to \$3.4 billion (in 2013 dollars); furthermore, approximately 13 million hours of travel time would be saved annually.   | <i>Economic Impacts</i> section beginning on page 4-56   |
| Air Quality                   | Implementation of the action alternatives would alter air quality conditions (as defined by criteria pollutants) in the Study Area.  | No. The project-level quantitative analyses for CO <sup>b</sup> and PM <sub>10</sub> <sup>c</sup> emissions demonstrated that the action alternatives would not contribute to any new local violations, increase the frequency or severity of any existing violation, or delay timely attainment of the NAAQS <sup>d</sup> or any required interim emissions reductions or other milestones. Changes in criteria pollutant conditions along the corridor would be distributed among all population segments.  | <i>Air Quality</i> section beginning on page 4-68  |

<sup>a</sup> Final Environmental Impact Statement   <sup>b</sup> carbon monoxide   <sup>c</sup> particulate matter of 10 microns or less in diameter   <sup>d</sup> National Ambient Air Quality Standards

(continued on next page)

**Table 4-12** Combined Discussion of Effects on Environmental Justice Populations (continued)

| Section of Chapter 4           | Potential Impacts  | Environmental Justice: Are there disproportionately high and adverse effects?  | Relevant FEIS <sup>a</sup> Text  |
|--------------------------------|--|--|--|
| <b>Air Quality (continued)</b> | Implementation of the action alternatives would alter air quality conditions (as defined by MSATs) <sup>e</sup> in the Study Area.   | No. The Preferred Alternative would have a marginal effect on annual emissions in 2025 and 2035 (less than a 1 percent difference in total annual emissions between the Preferred Alternative and No-Action Alternative). In 2025 and 2035, total Study Area emissions would decrease by more than 80 percent compared with 2012 emissions. With the Preferred Alternative in 2035, modeled MSAT emissions in the Study Area in 2035 would decrease from 57 to 92 percent, with a 47 percent increase in vehicle miles traveled compared with 2012 conditions. Changes in MSAT conditions along the corridor would be distributed among all population segments.   | <i>Air Quality</i> section beginning on page 4-68  |
| <b>Noise</b>                   | Implementation of the proposed action would introduce traffic noise where it currently does not exist and/or at higher levels than now experienced.  | No. Noise levels exceeding Noise Abatement Criteria would be experienced at specific locations along the entire length of the action alternatives and, therefore, all population segments along the alternatives would have freeway-generated noise exposure. Where exceedances in Noise Abatement Criteria thresholds would occur, noise barriers to reduce levels to below the thresholds are proposed pursuant to the ADOT <sup>f</sup> noise policy. The noise policy does not consider population characteristics as a criterion for mitigation.  | <i>Noise</i> section beginning on page 4-88  |
| <b>Water Resources</b>         | The action alternatives would alter water resources sufficiently to adversely affect environmental justice populations.  | No. The action alternatives' impacts on water quality, water supply and access, floodplains, groundwater supply, and waters of the United State are described in the appropriate sections of Chapter 4. No substantive impacts on water quality, water supply and access, groundwater, or floodplains would occur. Effects on waters of the United State are subject to the permitting requirements of Section 404 of the Clean Water Act and would be effectively mitigated.  | <i>Water Resources, Floodplains, and Waters of the United States</i> sections beginning on pages 4-101, 4-110, and 4-116, respectively   |
| <b>Biological Resources</b>    | A decrease in the amount of cover, nesting areas, connectivity, and food resources for wildlife species caused by habitat loss, fragmentation, and traffic disturbance would adversely affect environmental justice populations. | No. In addition to a general impact study, a Biological Evaluation was completed in 2014 to address project effects on listed and candidate species under the Endangered Species Act. The U.S. Fish and Wildlife Service has provided technical assistance on project effects on listed and candidate species, and ADOT and FHWA <sup>g</sup> have committed to continue coordination with the Arizona Game and Fish Department, Gila River Indian Community, and U.S. Fish and Wildlife Service regarding wildlife concerns as a result of the freeway's potential implementation.  | <i>Biological Resources</i> section beginning on page 4-125  |
|                                | Loss of native vegetation that are important to religious and cultural practices would occur.  | No. In addition to a general impact study, a Biological Evaluation was completed in 2014 to address project effects on listed and candidate species under the Endangered Species Act. The U.S. Fish and Wildlife Service has provided technical assistance on project effects on listed and candidate species, and ADOT and FHWA have committed to continue coordination with the Arizona Game and Fish Department, Gila River Indian Community, and U.S. Fish and Wildlife Service regarding vegetation concerns as a result of the freeway's potential implementation.   | <i>Biological Resources</i> section beginning on page 4-125  |
| <b>Cultural Resources</b>      | Loss and/or adverse alteration to cultural resources most associated with the South Mountains and their immediate surroundings would occur.  | No. Since the beginning of the EIS <sup>h</sup> process, FHWA and ADOT have been carrying out cultural resources studies and have been engaging in ongoing, open consultation with Gila River Indian Community government officials, the THPO <sup>i</sup> , the Cultural Resource Management Program, many different tribal authorities, and the SHPO <sup>j</sup> . The consultation has resulted in concurrence from the THPO and SHPO on National Register of Historic Places eligibility recommendations (including traditional cultural properties), project effects, and proposed mitigation and measures to minimize harm. This consultation has been ongoing and will continue until any commitments in a record of decision are completed, if an action alternative is the Selected Alternative. These proposed mitigation measures and measures to minimize harm accommodate and preserve (to the fullest extent possible from the available alternatives) access to the South Mountains for religious practices. | Chapter 2, <i>Gila River Indian Community Coordination; Land Use</i> section beginning on page 4-3; <i>Cultural Resources</i> section beginning on page 4-140; and Chapter 5, <i>Section 4(f) Evaluation</i> |
| <b>Hazardous Materials</b>     | Groundbreaking construction activities would release and then expose environmental justice population segments to hazardous materials.   | No. The action alternatives would not disturb known hazardous material sites. Known sites are groundwater-impact sites, and groundwater is found at a depth of over 60 feet below the footprint of the Preferred Alternative.  | <i>Hazardous Materials</i> section beginning on page 4-164   |
|                                | Trucks carrying hazardous cargo would expose environmental justice population segments to dangerous health events if a spill were to occur.  | No. The percentage of trucks using the proposed action would not be substantially different than those percentages experienced on all other freeways in the region. All population segments along the length of the proposed action would be exposed to trucks carrying hazardous cargo, but the probability of a spill of hazardous cargo is low.   | <i>Hazardous Materials</i> section beginning on page 4-164   |
| <b>Visual Resources</b>        | Implementation of the action alternatives would introduce a substantial human-made feature (the proposed action) into the environment, with a greater impact on environmental justice population segments.                       | No. The identification of alternatives and their locations to study in detail in the EIS process was based on a systemic, multidisciplinary process accounting for design, operational, environmental, cost, and acceptability considerations. The visual intrusion would be experienced by all population segments along the length of the project.   | <i>Visual Resources</i> section beginning on page 4-167  |

<sup>e</sup> mobile source air toxics <sup>f</sup> Arizona Department of Transportation <sup>g</sup> Federal Highway Administration <sup>h</sup> environmental impact statement <sup>i</sup> Tribal Historic Preservation Officer <sup>j</sup> State Historic Preservation Office



radio stations and public meeting handouts and comment forms were produced in English and Spanish.

- The SMCAT (see sidebar on page 6-8) included minority representatives (16 percent).

ADOT hosted a public information meeting on February 10, 2010, to discuss the shift from the W55 to the W59 Alternative. The meeting was held at Sunridge Elementary School, in Estrella Village, the elementary school that serves the multifamily apartment complex that would be acquired under the proposed alignment shift. Public comments were collected verbally by a court reporter and were submitted through comment forms, e-mails, and the project hotline. See Chapter 6 for additional details.

To optimize the opportunity for public participation in the public hearing on the Draft Environmental Impact Statement (DEIS) and, in particular, participation from identified environmental justice populations, ADOT offered free shuttle bus service to and from the public hearing located at the Phoenix Convention Center. Service was provided throughout the day (morning, noon, and evening trips) to and from 91st Avenue and Van Buren Street, 59th Avenue and I-10, Laveen Southern Ridge Golf Club, the Community's Komatke Boys and Girls Club, the Community Governance Center in Sacaton, and the 40th Street Park-and-Ride lot. In addition, parking vouchers and transit passes were provided at the public hearing for participants who drove or used transit services to attend the public hearing (see Chapter 6 for more detailed information).

The public hearing was advertised in Spanish-language newspapers and radio stations, and public hearing handouts and comment forms were produced in English and Spanish. In addition, Spanish-speaking court reporters were present to take public comments in Spanish. Spanish and Native-American language interpreters were available for those that requested this service. Following the public hearing, six community forums were held in the Estrella, Laveen, and Ahwatukee Foothills villages of Phoenix; within the Community; and in Chandler and Avondale. These forums provided a more informal opportunity to learn

about the DEIS. Attendees could watch the study video, view study materials, and talk to project team members. Spanish-speaking court reporters were available to take individual verbal comments with no time limit, and written comments could also be submitted (see Chapter 6 for more detailed information).

Mitigation

Based on the above discussion and analysis, none of the alternatives under consideration would cause disproportionately high and adverse effects on any minority or low-income populations in accordance with the provisions of Executive Order 12898 and USDOT Order 5610.2(a). Mitigation measures as presented in the sections, *Land Use* (beginning on page 4-3), *Social Conditions* (beginning on page 4-20), *Displacements and Relocations* (beginning on page 4-46), *Economic Impacts* (beginning on page 4-56), *Air Quality* (beginning on page 4-68), *Noise* (beginning on page 4-88), *Cultural Resources* (beginning on page 4-140), *Prime and Unique Farmlands* (beginning on page 4-161), *Visual Resources* (beginning on page 4-167), and *Temporary Construction Impacts* (beginning on page 4-173), would result in reduction, minimization, and avoidance of impacts as well as overall benefits to all populations in the Study Area.

Since the beginning of the EIS process, FHWA and ADOT have been carrying out cultural resources studies and engaging in ongoing, open consultation with Community government officials, the Tribal Historic Preservation Officer (THPO), the Cultural Resource Management Program, many different tribal authorities, and the State Historic Preservation Office (SHPO). The consultation has resulted in concurrence from the THPO and SHPO on National Register of Historic Places (NRHP) eligibility recommendations (including TCPs), project effects, and proposed mitigation and measures to minimize harm. This consultation has been ongoing and will continue until any commitments in a ROD are completed, if an action alternative is the Selected Alternative. These proposed mitigation measures and measures to minimize harm would accommodate and preserve (to the fullest extent possible from the available alternatives) access to the South Mountains for religious practices. For additional detail, see pages 4-159 and 5-27.

Conclusions

ADOT and FHWA have engaged all population segments to ensure access to the EIS study process. Assisted by this involvement, analytical results indicate the proposed action would benefit all populations in the Study Area in general by reducing traffic congestion, enhancing accessibility, and supporting local economic development plans.

- As part of the approved RTP—which includes planned improvements to the Regional Freeway and Highway System, arterial street network, transit, and other aspects of the region's freeway system (see the text box, *What is the Regional Transportation Plan?*, on page 1-5)—environmental justice populations would benefit from the RTP at approximately the same level or, in some cases, at a higher level than would populations in areas not considered to have environmental justice populations (MAG 2003). In connecting the eastern, southeastern, and southwestern regions of the Phoenix metropolitan area, the proposed action would provide improved access for all area residents to key employment areas to the north, south, and east along the I-10 corridor, and in central Phoenix.
- The proposed action would reduce congestion and improve the area transportation system. Improvements would be especially important given the projected growth and development in the southwestern Phoenix metropolitan area. Along with the general population, environmental justice populations would benefit from these improvements. Accessibility to regional public and private facilities and services would be improved. Under the No-Action Alternative, accessibility to employment and housing might be impeded by increased congestion.
- As is evident along existing freeways in the Phoenix metropolitan area, higher-density housing tends to be located along freeway routes, as can be seen along I-10 in the Study Area. The Phoenix *General Plan* identifies areas of higher-intensity land use along the route of the W59 (Preferred) Alternative, providing the potential benefit of affordable multifamily housing options in the future.

**Environmental justice and impacts**

All alternatives (including the No-Action Alternative) would have the potential to create adverse impacts on, as well as benefits for, all population segments in the Study Area and its surroundings. Impacts include community disruption and fragmentation; relocations and displacements; and air, noise, and visual quality intrusions from the proposed action. These impacts are directly addressed in the sections, *Land Use, Social Conditions, Displacements and Relocations, Economic Impacts, Air Quality, Noise, Cultural Resources, and Visual Resources*, found elsewhere in this chapter. In addressing environmental justice, it is important to understand whether the proposed action would have disproportionately high and adverse impacts on the environmental justice population.

Households using Section 8 vouchers would be affected by all of the Western Section action alternatives. Housing units that participate in the program are not limited, except by the availability of vouchers; therefore, the availability of replacement housing is not easily quantified. Based on discussions with the City of Phoenix Housing Department, there is currently replacement housing in the area. HUD reports that the “rental housing market in the City of Phoenix submarket is currently soft, with an estimated overall rental vacancy rate of 11 percent” (HUD 2013); therefore, replacement housing for residents of apartments potentially displaced by the W59 Alternative is currently available.

Impacts in the Eastern Section associated with the E1 Alternative would affect a largely affluent, nonminority population. Although the population in the Western Section is more diverse—with minority populations throughout and low-income populations largely in the area along I-10—adverse impacts would not be predominantly borne by minority or low-income populations. Furthermore, any adverse effects experienced by minority or low-income populations would not be appreciably more severe or greater in magnitude than the adverse effects that would be experienced by other population segments or the general population.

Indirect impacts resulting from adverse changes in air quality, noise, and visual resources are discussed in other sections of this chapter; however, these impacts are not deemed to be disproportionately high or adverse for minority, low-income, disabled, elderly, and female head-of-household population segments, as previously discussed in this section and as shown in Figures 4-10 through 4-14, which illustrate the geographic distribution of such population segments in the Study Area. All action alternatives and options would have an adverse effect on environmental justice populations, primarily during construction, but impacts would be temporary and would not create undue hardship or be disproportionately high compared with projected impacts on all populations in the Study Area, as illustrated in Table 4-11.

With regard to impacts on places of spiritual importance to certain population segments, such as the South

Mountains TCP, that raise potential environmental justice concerns with respect to Native American tribes, in particular, the Community, extensive consultation, avoidance alternatives analyses, and mitigation measures are discussed throughout the FEIS. A sampling of these efforts is noted on page 4-38. Even if one were to reach a contrary conclusion and determine that disproportionately high and adverse effects would occur as a result of the proposed freeway, there is substantial justification for the proposed freeway. It is needed to serve projected growth in population and accompanying transportation demand and to correct existing and projected transportation system deficiencies (see Chapter 1, *Purpose and Need*). There is no feasible and prudent alternative to the use of the South Mountains, as discussed in Chapter 5, *Section 4(f) Evaluation*.

All populations would benefit from the proposed action’s implementation through improved regional mobility and reduced local arterial street traffic.

**TITLE VI OF THE CIVIL RIGHTS ACT OF 1964**

Title VI prohibits discrimination based on race, color, and national origin. Specifically, 42 U.S.C. § 2000d states that “No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.” Protections afforded under Title VI apply to everyone, regardless of whether the individual is lawfully present in the United States or is a citizen of the United States.

The minority groups addressed by Title VI are:

- Black (a person having origins in any of the black racial groups of Africa)
- Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race)
- Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands)
- American Indian and Alaskan Native (a person having origins in any of the original peoples of North

- America and who maintains cultural identification through tribal affiliation or community recognition)
- some other race (a person who does not identify with one of the four previously listed races) or persons of more than one race

**Data Assumptions**

To establish whether the proposed action would have disparate impacts on Title VI populations, a basis for comparison was established. Because the proposed action would affect multiple jurisdictions, all within Maricopa County, the county was identified as the area of comparison.

Title VI populations were identified as those populations in census geographies where the percentage of the Title VI population is known to exceed the percentage of an “identifiable group,” in accordance with FHWA guidance. This study used a lower threshold for the identifiable group by determining the lesser of either 1½ times the area of comparison (72 percent for Maricopa County) or 50 percent of the total population in the census geography.

The demographic information used in this analysis was from the 2010 U.S. Census. To focus on potentially affected neighborhoods, the smallest unit of analysis for each of the studied populations was identified. Census block-level data were used to identify minority populations.

**Affected Environment**  
**Affected Populations**

The percentages of the Title VI populations for the Study Area, affected jurisdictions, Maricopa County, and the state of Arizona are shown in Table 4-10. Compared with Maricopa County as a whole, the Study Area has a greater percentage of Title VI populations. The portion of minorities in the Study Area is 68 percent, 27 percentage points higher than the county percentage of 41 percent.

Census blocks containing a percentage of minorities at or above 50 percent are distributed throughout the Study Area. Within the Study Area, the blocks with the greatest percentage of minority populations are



located within ½ mile of I-10 (Papago Freeway) and within the Community. While minority populations are widely distributed in the Study Area, two communities, Santa Maria and Tolleson, bear further discussion (see Figure 4-8, on page 4-22, for community descriptions). Notable observations include:

- Census blocks that make up the Santa Maria community have populations of between 76 and 100 percent minorities, mostly Hispanic. Additionally, a strong sense of community exists, as evidenced by the percentage of area residents who have lived in the same home since before 1995 (72 percent)—almost twice the corresponding figure for Maricopa County (37 percent) (U.S. Census Bureau 2010b).
- Overall, the city of Tolleson is 89 percent minority. In this largely Hispanic community (80 percent), Spanish is spoken in 70 percent of households, compared with Maricopa County, where 21 percent of households speak Spanish in the home (American Community Survey 2007–2011).

### Displacements and Impacts

49 Code of Federal Regulations (C.F.R.) Part 21, Appendix C, (a)(2)(vi) states that “The State shall not locate or design a highway in such a manner as to require, on the basis of race, color or national origin, the relocation of any persons.” The alternatives evaluated in the FEIS were identified through an iterative, multidisciplinary screening process of defining a range of reasonable alternatives that met the project purpose and need. All alternatives were designed to avoid, minimize, or mitigate impacts on all populations, including minority populations. Displacements and access to the proposed action were considered in determining possible disparate impacts in the alternatives screening process, which is described in Chapter 3, *Alternatives*.

Specific impacts for each of the Western and Eastern Section action alternatives are discussed below. All action alternatives and options would affect census blocks with minority populations greater than 50 percent because of displacements and relocations associated with the R/W needs of the proposed freeway. Replacement housing policy and guidance are addressed in the

section, *Displacements and Relocations*, beginning on page 4-46.

Figure 4-10 presents the distribution of minority populations within the Study Area. This figure and Table 4-13 in the section, *Displacements and Relocations*, were used to determine impacts.

All action alternatives would entail construction impacts that would affect all populations—Title VI and otherwise. Such impacts would be temporary and would not cause undue hardship on any one population, and they are spread amongst Title VI populations as well as nonminority populations.

### Action Alternatives, Western Section

#### W59 (Preferred) Alternative

The W59 Alternative would displace the fewest residential properties. Nine of the 12 census blocks with residential displacements under the W59 Alternative contain 50 percent or greater minority populations. Of these 9 census blocks, impacts on 1 block are common to all of the Western Section action alternatives. The W59 Alternative would avoid impacts on minority populations within Tolleson and Santa Maria. The W59 Alternative would also avoid impacts on annual tax revenues of the Cities of Avondale and Tolleson; both communities contain greater than 50 percent minorities (66 percent and 89 percent, respectively).

Of the single-family residential displacements that would occur under the W59 Alternative, 28 displacements would occur in an established subdivision immediately adjacent to I-10, and 9 displacements would occur in the Rio Del Rey subdivision at Broadway Road and 63rd Avenue. Rio Del Rey is in the Riverside Elementary School District, which reported that a majority of its students are minorities. The remaining 9 displacements caused by the W59 Alternative would be rural residential properties, primarily located south of the Salt River.

In addition to the single-family residential displacements, the W59 Alternative would displace two apartment complexes totaling up to 680 units. These apartments fall within a census block where greater than 50 percent of the population is minority. Most of the

apartment units have “market-rate” rents; however, one apartment complex accepts Section 8 housing vouchers (of the 264 units in the complex, 16 currently use Section 8 vouchers).

#### W71 Alternative

Of the 56 census blocks with residential displacements that would be caused by the W71 Alternative, 51 contain minority populations of 50 percent or greater than the census blocks’ total population. Nearly half of the 705 single-family homes that would be affected by the W71 Alternative are within the Laveen Meadows, Laveen Ranch, and Laveen Farms subdivisions. These subdivisions are within the Laveen Elementary School District, where the local elementary school (Desert Meadows Elementary) reported that a majority of the students are minorities.

Another 252 single-family homes that would be affected by the W71 Alternative are homes within the Sienna Vista, Windsong, and Estrella Village subdivisions. These subdivisions consist largely of census blocks with greater than 50 percent minority populations.

The W71 Alternative would purposefully avoid affecting the community of Santa Maria and Santa Maria Middle School, located along Lower Buckeye Road. The W71 Alternative would also avoid impacts on annual tax revenues of the Cities of Avondale and Tolleson; both communities contain greater than 50 percent minorities (66 percent and 89 percent, respectively).

#### W101 Alternative

The options of the W101 Alternative would result in varying impacts on census blocks with minority populations representing 50 percent or greater of the census blocks’ total population. A number of these census blocks are common to all three options, while the W101 Alternative Eastern Option would affect the most census blocks with minority populations and the Western Option would affect the fewest census blocks with minority populations.

#### Western Option

The W101 Alternative Western Option would displace an additional 171 single-family homes in the

Country Place subdivision. This subdivision consists of census blocks with greater than 50 percent minority populations. An additional 3 residences using Section 8 housing vouchers would be affected.

**Central Option**

The W101 Alternative Central Option would displace an additional 344 single-family homes in the 91st Avenue and Lower Buckeye Road and Hurley Ranch subdivisions, consisting almost entirely of census blocks with greater than 50 percent minority populations. An additional 9 residences using Section 8 housing vouchers would be affected by this option.

**Eastern Option**

The W101 Alternative Eastern Option would displace an additional 430 single-family homes in the 91st Avenue and Lower Buckeye Road, Ryland at Heritage Point, 83rd Avenue and Lower Buckeye Road, and Hurley Ranch subdivisions, consisting almost entirely of census blocks with greater than 50 percent minority populations. These subdivisions are within the Union Elementary School District, which reported that a majority of students are minorities. An additional 11 residences using Section 8 housing vouchers would be affected by this option.

No residential displacements would occur in Tolleson as a result of the proposed action. Project-related disruptions in Tolleson would chiefly occur in industrial areas and would not adversely affect residential neighborhoods. The proposed action would not cut off access or restrict the mobility of Title VI populations. Access to the high school would not be impaired. However, impacts on developed and developable commercial land in Tolleson would affect the City’s tax base, directly affecting the funding available to provide services to its largely minority population.

**Action Alternative, Eastern Section**

**E1 (Preferred) Alternative**

The E1 Alternative would result in 121 residential displacements. Two of the ten census blocks with residential displacements contain minority populations. Most displacements resulting from the E1 Alternative would affect residences in census geographies where the

percentage of the Title VI population is less than that of the Study Area as a whole.

The FEIS discloses impacts on places of spiritual importance to the Community; the most notable discussions can be found in the section, *Impacts on TCPs, Action Alternatives, Western and Eastern Sections*, beginning on page 4-143, and in the section, *The South Mountains (Muhadagi Doag) as a Traditional Cultural Property*, beginning on page 5-26. A representative impact is the Community member-expressed concern that the E1 Alternative would interfere with ceremonial practices and religious activities of some Native American groups. While impacts on the South Mountains TCP would be substantial and unique in context, the direct conversion of lands to a transportation use would be limited to less than 0.2 percent of SMPP and would not prohibit ongoing access and the cultural and religious practices by Native American tribes. Mitigation measures and measures to minimize harm as the result of extensive consultation, avoidance alternatives analyses, and efforts in developing mitigation strategies would accommodate and preserve (to the fullest extent possible from the available alternatives) access to the South Mountains for religious purposes.

**Participation of Affected Populations**

49 C.F.R. § 21.5(b)(vii) states that a person shall not be denied the “opportunity to participate as a member of a planning, advisory, or similar body which is an integral part of the program.” Participation by protected classes in the EIS process was encouraged and facilitated. As noted on page 1-4, three Native American communities, including the Community, are members of MAG, the metropolitan planning organization for the area. MAG’s Regional Council consists of elected officials, and 14 percent of its members are minority. In addition to involvement in MAG planning efforts, there were many targeted efforts to include members of Title VI populations (with regard to race and national origin) in the conduct of the EIS process. Chapter 6, *Comments and Coordination*, describes these efforts in detail and Chapter 2, *Gila River Indian Community Coordination*, describes the efforts to involve the Community. As discussed on page 2-9, Community members attended regular meetings of the SMCAT

until 2006, when the Community requested all project-related communications take place at a government-to-government level. The SMCAT membership was 16 percent minority.

In the course of the EIS process, coordination meetings were held with the Community and presentations were made to various Community groups (see Chapter 2 for information about these meetings). Public meetings were advertised in Spanish-language newspapers and radio stations, and public meeting handouts and comment forms were produced in English and Spanish.

To optimize the opportunity for public participation in the public hearing on the DEIS and, in particular, participation from identified Title VI populations, ADOT offered free shuttle bus service to and from the public hearing located at the Phoenix Convention Center. Service was provided throughout the day (morning, noon, and evening trips) to and from 91st Avenue and Van Buren Street, 59th Avenue and I-10, Laveen Southern Ridge Golf Club, the Community’s Komatke Boys and Girls Club, the Community Governance Center in Sacaton, and the 40th Street Park-and-Ride lot. In addition, parking vouchers and transit passes were provided at the public hearing for participants who drove or used transit services to attend the public hearing (see Chapter 6 for more detailed information).

The public hearing was advertised in Spanish-language newspapers and radio stations, and public hearing handouts and comment forms were produced in English and Spanish. In addition, Spanish-speaking court reporters were present to take public comments in Spanish, and Native American-speaking interpreters were available for those that requested this service. Following the public hearing, six community forums were held in the Estrella, Laveen, and Ahwatukee Foothills villages of Phoenix; within the Community; and in Chandler and Avondale. These forums provided a more informal opportunity to learn about the DEIS. Attendees could watch the study video, view study materials, and talk to project team members. Spanish-speaking court reporters were available to take individual verbal comments with no time limit, and written



comments could also be submitted (see Chapter 6 for more detailed information).

## Mitigation

As discussed above, no disparate adverse impacts on populations afforded protection under Title VI would occur; however, mitigation measures as presented in the sections, *Displacements and Relocations* (beginning on page 4-46) and *Cultural Resources* (beginning on page 4-140), would be implemented. As part of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act), ADOT and its consultants and contractors must prevent discrimination in all highway programs and must ensure compliance with Title VI. For this project, all eligible displaced people would receive the same opportunities with regard to services, benefits, and financial aid. For additional detail, see page 4-46.

Since the beginning of the EIS process, FHWA and ADOT have been carrying out cultural resources studies and engaging in ongoing, open consultation with Community government officials, the THPO, the Cultural Resource Management Program, many different tribal authorities, and the SHPO. The consultation has resulted in concurrence from the THPO and SHPO on NRHP eligibility recommendations (including TCPs), project effects, and proposed mitigation and measures to minimize harm. This consultation has been ongoing and will continue until any commitments in a ROD are completed, if an action alternative is the Selected Alternative. These proposed mitigation measures and measures to minimize harm accommodate and preserve (to the fullest extent possible from the available alternatives) access to the South Mountains for religious practices. For additional detail, see pages 4-159 and 5-27.

## Conclusions

ADOT and FHWA have engaged all population segments to ensure access to the EIS study process. Assisted by this involvement, analytical results indicate the proposed action would benefit all populations in the

Study Area in general by reducing traffic congestion, enhancing accessibility, and supporting local economic development plans. As part of the approved RTP—which includes planned improvements to the Regional Freeway and Highway System, arterial street network, transit, and other aspects of the region’s freeway system (see the text box, *What is the Regional Transportation Plan?*, on page 1-5)—Title VI populations would benefit from the RTP at approximately the same level or, in some cases, at a higher level than would populations in areas not considered to have Title VI populations (MAG 2003). In connecting the eastern, southeastern, and southwestern regions of the Phoenix metropolitan area, the proposed action would provide improved access for all area residents to key employment areas to the north, south, and east along the I-10 corridor, and in central Phoenix. Improvements would be especially important given the projected growth and development in the southwestern Phoenix metropolitan area. Along with the general population, Title VI populations would benefit from these improvements. Accessibility to regional public and private facilities and services would be improved.

Impacts in the Eastern Section associated with the E1 Alternative would displace a largely nonminority population. Although the population in the Western Section is more diverse—with minority populations throughout—adverse impacts would not be predominantly borne by minority populations. Furthermore, any adverse effects experienced by minority populations would not be appreciably more severe or greater in magnitude than the adverse effects that would be experienced by other population segments or the general population. Although all Western Section alternatives would displace minority families, all eligible displaced people would receive the same opportunities with regard to services, benefits, and financial aid regardless of his or her race, color, or national origin.

The environmental justice conclusion that there would be no disproportionately high and adverse effect on minority and low-income populations also supports

a determination that there is no disparate impact on minority groups protected by Title VI.

Although no disparate adverse impacts on populations afforded protection under Title VI would occur, mitigation measures are nonetheless provided in the sections, *Displacements and Relocations* (beginning on page 4-46) and *Cultural Resources* (beginning on page 4-140). As part of the Uniform Act, ADOT and its consultants and contractors must prevent discrimination in all highway programs and must ensure compliance with Title VI. For this project, all eligible displaced people would receive the same opportunities with regard to services, benefits, and financial aid. For additional detail, see page 4-51.

Additionally, since the beginning of the EIS process, FHWA and ADOT have been carrying out cultural resources studies and engaging in ongoing, open consultation with Community government officials, the THPO, the Cultural Resource Management Program, many different tribal authorities, and the SHPO. The consultation has resulted in concurrence from the THPO and the SHPO on NRHP eligibility recommendations (including TCPs), project effects, and proposed mitigation and measures to minimize harm. This consultation has been ongoing and will continue until any commitments in a ROD are completed, if an action alternative is the Selected Alternative. These proposed mitigation measures and measures to minimize harm accommodate and preserve (to the fullest extent possible from the available alternatives) access to the South Mountains for religious purposes. For additional detail, see pages 4-159 and 5-27.

Even if one were to reach a contrary conclusion and determine that disparate adverse impact(s) would occur as a result of the proposed freeway, there is substantial justification for the proposed freeway. It is needed to serve projected growth in population and accompanying transportation demand and to correct existing and projected transportation system deficiencies (see Chapter 1, *Purpose and Need*), and there is no feasible and prudent alternative to the use of the South Mountains as shown in Chapter 5, *Section 4(f) Evaluation*.

DISPLACEMENTS AND RELOCATIONS

AFFECTED ENVIRONMENT

Construction of the new freeway facility would cause displacement of households, businesses, and public facilities. In addition to displacements, changes in accessibility along the new facility could also affect properties adjacent to the freeway by altering travel patterns. The resulting displacement impacts would primarily involve residential properties, but commercial establishments would also be affected.

ENVIRONMENTAL CONSEQUENCES

Impact Overview,  
Western and Eastern Sections

The action alternatives would predominantly displace residents of single-family homes, as shown in Table 4-13. Displacements under each action alternative would

primarily be concentrated in the northwestern and southeastern portions of the Study Area, areas undergoing rapid development and containing numerous single-family residential neighborhoods, and a warehouse/distribution area for many Phoenix-area businesses.

A number of existing undeveloped tracts of land are also located near or within the action alternatives' proposed R/W. Single-family subdivisions greater than 25 acres in size have been developed or have been proposed for a large portion of the Western Section of the Study Area (see the section, *Development Plans*, on page 4-7, to learn about development activity in the Study Area). Impacts on undeveloped single-family residential lots have also been considered in the displacement and relocation analysis. Table 4-13 shows the potential displacement impacts, by action alternative.

Action Alternatives, Western Section

As shown in Table 4-13, the W59 (Preferred) Alternative would result in the most business displacements, while the W101 Alternative Eastern Option would result in the most residential displacements. The W101 Alternative Eastern Option would also affect the most platted lots and, therefore, would potentially result in additional residential displacements.

Action Alternative, Eastern Section

Displacements associated with the E1 (Preferred) Alternative would occur primarily along Pecos Road in Ahwatukee Foothills Village. The Mountain Park Community Church would be displaced under this action alternative. Coordination with the City of Phoenix regarding the 32nd Street and 25th Avenue interchanges resulted in both being removed from the proposed action. These interchanges would have affected additional residences, had they been included.

No displacements would occur on Community land.

No-Action Alternative

No property would need to be acquired if the No-Action Alternative were identified as the Selected Alternative. Therefore, no displacements or relocations would occur. The No-Action Alternative would not preclude proposal of a project similar to the proposed action in the future that could, in turn, result in displacements and relocations. As additional development in the area occurs, an even greater number of displacements and relocations would likely be required if such a project were constructed in the future.

Residential Relocation Potential,  
Western and Eastern Sections

Housing in the Study Area is predominantly single-family, with a range of older housing built in the 1950s through 1970s to new housing recently constructed. According to the 2010 Census, the housing units vacancy rate in the Study Area was 11.7 percent and

Table 4-13 Potential Displacements, Action Alternatives

| Action<br>Alternative/Option <sup>a</sup> | Businesses <sup>b</sup> | Residential     |                   |                 |                 |             | Community<br>Facilities <sup>c</sup> | Utilities <sup>d</sup> |
|---|-------------------------|-----------------|-------------------|-----------------|-----------------|-------------|--------------------------------------|------------------------|
|   |                         | SF <sup>e</sup> | Lots <sup>f</sup> | MH <sup>g</sup> | MF <sup>h</sup> | Total       |                                      |                        |
| Western Section                           |                         |                 |                   |                 |                 |             |                                      |                        |
| W59                                       | 42                      | 46              | 0                 | 1               | 680             | 727         | 0                                    | 0                      |
| W71                                       | 26                      | 705             | 134               | 0               | 0               | 839         | 0                                    | 0                      |
| W101 Western Option                       | 14–30 <sup>i</sup>      | 631–632         | 307–308           | 2               | 0               | 940–942     | 3                                    | 0–2                    |
| W101 Central Option                       | 14–29                   | 802             | 331               | 0               | 0               | 1,113       | 3                                    | 0–2                    |
| W101 Eastern Option                       | 14–28                   | 890             | 423–428           | 0               | 0               | 1,313–1,318 | 3                                    | 0–2                    |
| Eastern Section                           |                         |                 |                   |                 |                 |             |                                      |                        |
| E1  | 0                       | 112             | 0                 | 9               | 0               | 121         | 1                                    | 0–2                    |

Source: aerial photography flown in 2012

<sup>a</sup> Displacements were estimated using aerial photographs.

<sup>b</sup> includes businesses whose buildings are directly affected; does not include businesses whose parking and outdoor storage areas would be affected by an action alternative; count reflects the number of structures involved in business activities, not the number of actual businesses; counts have not been reconciled with the counts shown in Table 4-14, which derive from a Maricopa Association of Governments database, because the number of businesses could change as frequently as weekly or monthly

<sup>c</sup> includes schools

<sup>d</sup> includes electric substations, communication facilities, well stations, etc.

<sup>e</sup> single-family

<sup>f</sup> includes an estimate of the number of lots platted without homes being built

<sup>g</sup> manufactured homes

<sup>h</sup> multifamily, represents number of units potentially affected

<sup>i</sup> W101 Alternative and Options include ranges because of design options.



the overall rental vacancy rate was 5 percent for the census block groups that make up the Study Area. More recent data indicate a higher rental vacancy rate—the Phoenix-Mesa-Scottsdale metropolitan statistical area’s rental vacancy rate during the third quarter of 2013 was 8.6 percent (U.S. Census Bureau 2013). Subdivisions containing single-family homes of similar size and style to those that would potentially be displaced have been developed in the Study Area during recent years. In addition, there are several platted subdivisions that have not yet been developed. The impact of residential relocations on environmental justice and Title VI populations is discussed in the *Environmental Justice and Title VI* section.

For the purposes of this analysis, it is assumed that residents displaced by action alternatives would most likely relocate in the Study Area and farther into the developing suburbs to the east and west. This area allows for the same proximity to existing services and facilities, such as schools, parks, medical offices, retail shopping areas, and freeway access.

Interim population and land use projections from MAG indicate that the Study Area will continue to grow substantially in the future (see Chapter 1, *Purpose and Need*, for further discussion regarding growth). To summarize, the entire Study Area’s population will grow by a projected 56 percent between 2010 and 2035, and the number of dwelling units in the Study Area is projected to grow by 46 percent during the same period. Single-family residential development would continue to replace vacant land and spread west and south. The population growth rate in the Eastern Section would be expected to be slower (the area is nearly built-out) and will increase by only 21 percent, while the number of dwelling units will increase by 13 percent between 2010 and 2035.

Data from the Maricopa County Assessor’s office on recent sales and comparable prices indicate potentially displaced residences located within the action alternatives in the Western Section generally range in value from the low \$100,000s for some of the older housing up to the low \$300,000s for newly constructed housing. Applicable

housing located in the Eastern Section generally ranges in value from the upper \$200,000s to the low \$600,000s.

A survey of real estate sales listings in November 2013 was conducted to determine the availability and prices of existing homes similar to those that would be displaced. Real estate listings for four ZIP Codes in southwestern Phoenix (85323, 85353, 85043, and 85048) were examined for similar-size homes. The data indicated that comparable single-family dwellings would exist for replacement housing, particularly in the area of the action alternatives in the Western Section, which includes ZIP Codes 85323, 85353, and 85043. Approximately 500 single-family homes were listed for these areas, at an average price of \$150,000. Real estate availability in the Eastern Section of the Study Area was not as prevalent, although the existing listings showed approximately 200 comparable homes for sale at an average price of \$321,000.

As population in the Phoenix metropolitan area increases, demand for housing in the Study Area would also increase. Newly constructed housing would most likely provide some of the replacement housing required as a result of construction of any of the action alternatives and options in the Western Section. It is likely, however, that the supply would be tighter and the accompanying demand higher in and near Ahwatukee Foothills Village because it is much more densely developed and has fewer opportunities for new single-family home construction. Tempe has available housing, and the communities of Chandler and Gilbert are projected to grow in the next 20 years and would provide other options for relocation of displaced residents from this area. A combination of available housing and newly built homes projected and/or planned for development would accommodate the expected number of relocations, especially if R/W acquisition were to occur over an extended period of time.

**Businesses Relocation Potential, Western and Eastern Sections**

The action alternatives would cause economic impacts on businesses that would range from beneficial (resulting from improved highway access for transportation

companies) to highly adverse (such as displacement). For those remaining businesses, impacts would be temporary (such as accessibility problems during project construction) or permanent (such as lack of visibility or accessibility from the new freeway). Displacement impacts would be mitigated through relocation or site purchase at a fair market price. Business revenue impacts, however, would not be mitigated. The following sections focus initially on business displacements and then identify potential impacts on remaining businesses.

Although displacement could be an adverse impact on a given business, it is not necessarily an adverse impact on the economy. As previously stated, these impacts would be mitigated through relocation or outright purchase of the business site. If demand for the types of services provided by the businesses remains, activity should continue at the new location, especially when it is reasonably near the existing location.

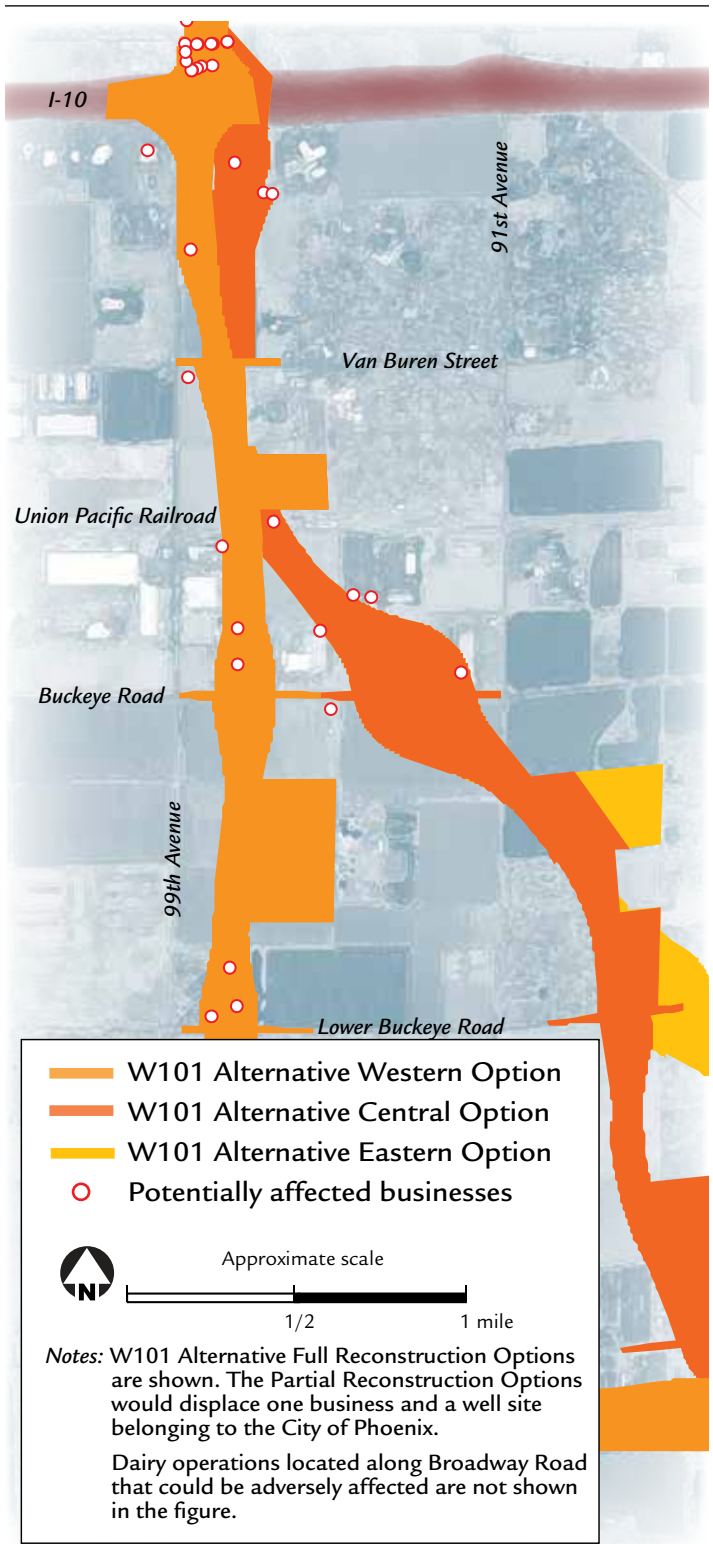
Such is the case with most types of businesses in the Western Section. Some businesses in the corridor, however, are characterized by very high levels of capital investment and serve a regional demand for their products. Some businesses also require rail access. Displacing these businesses and relocating or rebuilding their capital equipment would be very expensive, may result in relocation out of the region, or may cause them to close. These businesses will be discussed in the context of the action alternative in which each business is located.

Businesses potentially displaced by each action alternative are shown in Figures 4-15 through 4-17, which use aerial photography to show the specific location of each displaced business with respect to the proposed action alternatives. Table 4-14 summarizes the business displacements, by action alternative, according to the nature of the business.

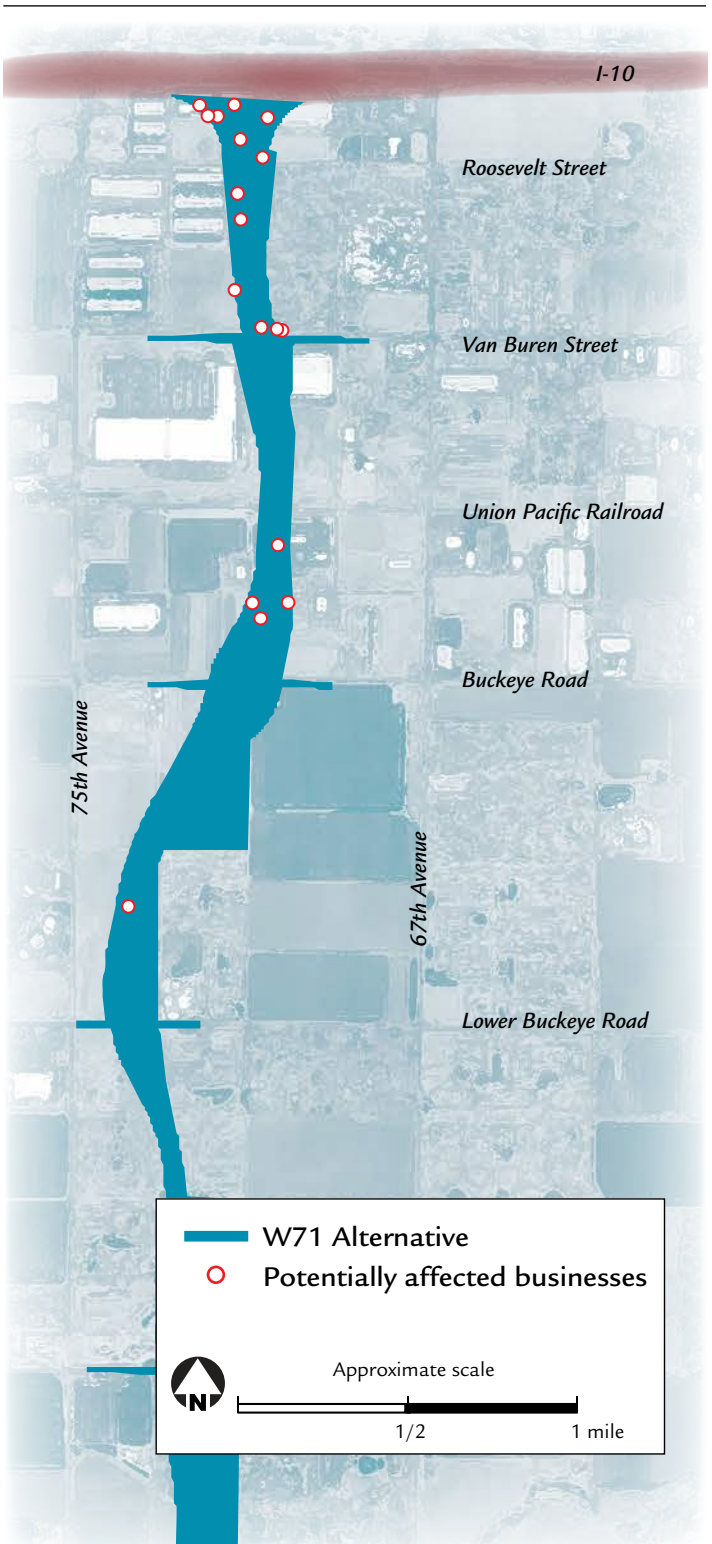
**Action Alternatives, Western Section**  
**W59 (Preferred) Alternative**

Of the Western Section action alternatives, the W59 Alternative would result in the most business relocations. Manufacturing, retail trade, and

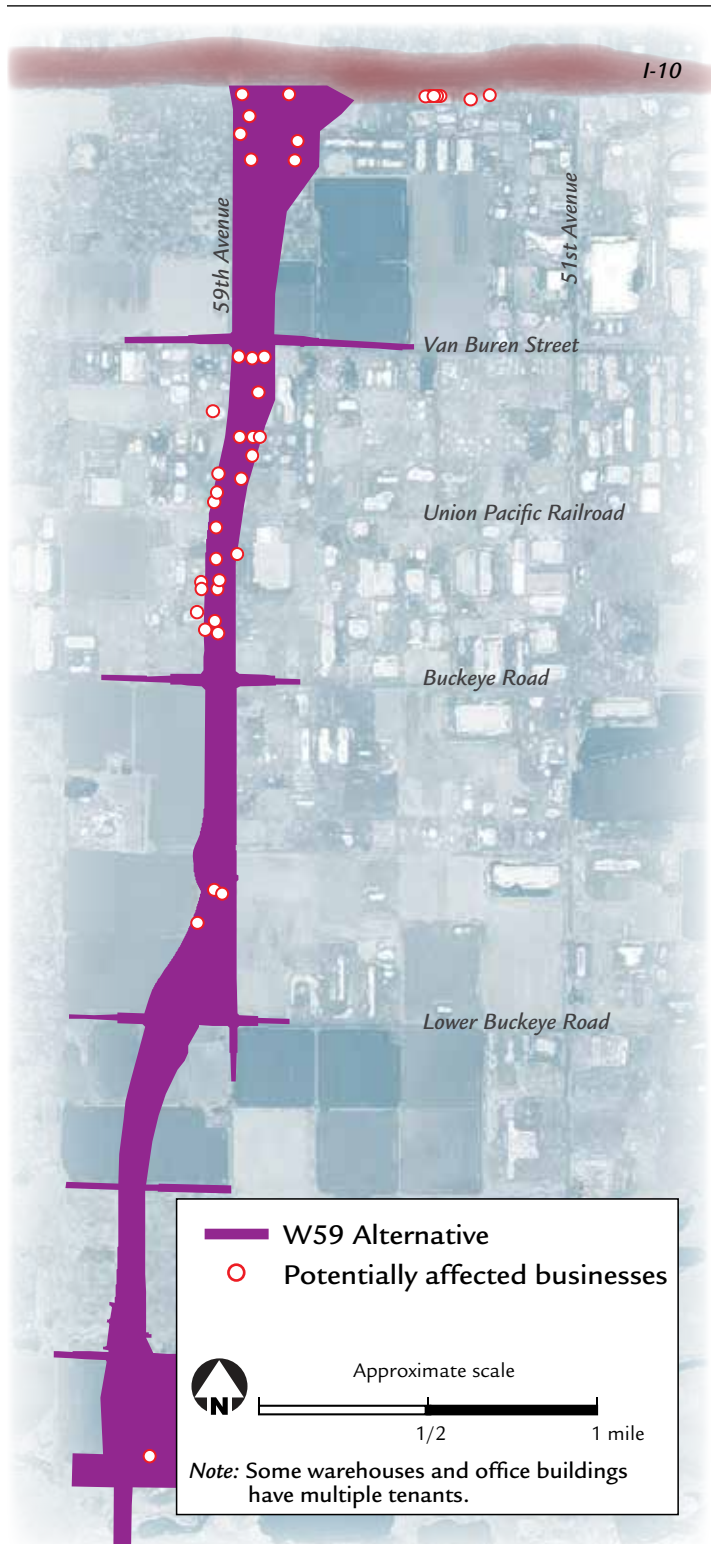
**Figure 4-15** Potential Business Relocations, W101 Alternative and Options



**Figure 4-16** Potential Business Relocations, W71 Alternative



**Figure 4-17** Potential Business Relocations, W59 Alternative



The number of business displacements would be greatest with the W59 Alternative. Many business owners chose locations in the area in part because of the expectation of the proposed freeway being constructed nearby. See Tables 4-13 and 4-14 for more detail regarding potential business relocations.



transportation and warehousing would account for more than half the total number of displaced businesses. The largest number of employers is in the retail fields. Retail businesses tend to be relatively easier to relocate because their equipment and workforce are generally more mobile than industrial and manufacturing enterprises, with less site-specific capital investment. Several machinist facilities manufacture metal products. These processes tend to have large, heavy equipment fixed in place. Removal and reinstallation would result in high costs and business disruption. These businesses would, however, likely remain viable within the region if relocated (with the project sponsor assuming the comparatively high costs of relocation).

Most businesses could be relocated within the region; because of limited information available during data-gathering efforts, however, there are three businesses whose operations are unclassified. The known types of businesses are not so site-specific that displacement by the proposed action may cause them to leave the region. Therefore, the relocations of these businesses should not cause an adverse economic impact on the region.

W71 Alternative

Of the displaced businesses, there would be three each in the transportation and warehousing and wholesale trade industries, two each in the construction, manufacturing, and retail trade industries, and one in professional services. One of the manufacturing businesses, Daystar, would be difficult to relocate. It is a plastics product manufacturer with a high level of capital investment specially invented by the company for production. The equipment would be difficult to move and would be difficult to replace without prefabrication.

Similar to the nature of the businesses along the W59 Alternative, with the exception of Daystar, it appears that the displacement or relocation of businesses along the W71 Alternative would not cause regional economic impacts because the demand for these goods and services would likely continue into the future.

Table 4-14 Summary of Business Displacements, Action Alternatives

| Action Alternative/Option | Business                        |  |   |              |               |   |  |                       |              |                                |                 |       |
|---------------------------|---------------------------------|--|---|--------------|---------------|---|--|-----------------------|--------------|--------------------------------|-----------------|-------|
|                           | Accommodation and Food Services | Administrative and Support and Waste Management and Remediation Services | Agriculture, Forestry, Fishing, and Hunting | Construction | Manufacturing | Other Services (except Public Administration) | Professional, Scientific, and Technical Services | Public Administration | Retail Trade | Transportation and Warehousing | Wholesale Trade | Total |
| Western Section           |                                 |  |   |              |               |   |  |                       |              |                                |                 |       |
| W59                       | 2                               | 0  | 0   | 1            | 4             | 2   | 4  | 0                     | 5            | 4                              | 2               | 24    |
| W71                       | 0                               | 0  | 0   | 2            | 2             | 0   | 1  | 0                     | 2            | 3                              | 3               | 13    |
| W101 Western Option       | 2–3 <sup>a</sup>                | 0–1  | 1   | 2            | 2–3           | 0–3   | 0–1  | 1                     | 4–6          | 1                              | 2–3             | 18–22 |
| W101 Central Option       | 0–1                             | 0–1  | 1   | 1            | 1–2           | 1–4   | 1–2  | 1                     | 1–3          | 1                              | 1–2             | 12–16 |
| W101 Eastern Option       | 0–1                             | 0–1  | 0   | 1            | 1–2           | 1–4   | 1–2  | 1                     | 1–3          | 1                              | 1–2             | 11–15 |
| Eastern Section           |                                 |  |   |              |               |   |  |                       |              |                                |                 |       |
| E1                        | 0                               | 0  | 0   | 0            | 0             | 2   | 0  | 0                     | 0            | 0                              | 0               | 2     |

Sources: Maricopa Association of Governments 2012 Business Database  
Notes: The Maricopa Association of Governments 2012 Business Database may indicate numerous businesses within one location (address). The “other services” category includes health care and social assistance. “Professional, scientific, and technical services” include educational services, finance and insurance, real estate, and rental and leasing.  
<sup>a</sup> W101 Alternative and Options include ranges because of design options.

W101 Alternative and Options

The options of the W101 Alternative would displace businesses, primarily in Tolleson. In contrast to the W59 and W71 Alternatives, few transportation and warehousing businesses would be in the proposed R/W; only one transportation and warehousing business would be displaced. Large businesses with substantial employment, however, would be adversely affected. Similar to the other action alternatives, many of the businesses along the W101 Alternative could be relocated with minimal impact on the regional economy. Adverse impacts on the regional economy resulting from the W101 Alternative and Options would result from impacts on a limited number of businesses:

- The W101 Alternative Central and Eastern Options would displace two major Tolleson employers: Atrium Door & Window Company and Holsum Bakery. Atrium Door & Window Company, employing nearly 300 people, serves a large market throughout the Southwest and could continue business in a range of locations inside or outside of the Phoenix region. Holsum Bakery, which employs about 180 people, is one of the few flour milling businesses in the region. Because of the nature of its operations, this business would require a similar location with rail and truck access. Both businesses would likely be very expensive to relocate because of high levels of capital investment in their plants. In addition, Holsum Bakery has expressed concerns about the feasibility of relocating without major

If My Property Would Be Affected, Can ADOT Purchase the Land in Advance?

Concerns have been raised by people whose properties are known to be in the alignment of one of the action alternatives or may abut the proposed new freeway. Owners of several properties located adjacent to the R/W boundary have claimed that the new freeway would cause hardships, such as increased noise, degraded visual quality, decreased property values, inability of owners to sell their property because of the location of the new freeway, or structural damage from project construction activities.

ADOT has a process in place to evaluate hardship claims on a case-by-case basis and determine whether compensation is required. Additionally, the Arizona Department of Administration Risk Management Section has a process in place to evaluate compensation for structural damages.

Hardship Acquisitions

The hardship acquisition process is similar to the regular acquisition process, except properties must meet strict criteria outlined in Chapter 7 of the current ADOT *Right-of-Way Procedures Manual* to be eligible for hardship acquisitions. The property owner must provide a written request to the ADOT Project Management Coordinator that describes the nature of the hardship. To be eligible for hardship acquisition, property owners must meet one of the criteria and provide supporting documentation generally outlined in the accompanying table. The property owner documents an inability to sell the property because of the impending project at fair market value within a time frame that is typical of properties not affected by the impending project. It is the responsibility of the applicant to understand the specifics of the supporting documentation.

After receiving all required documentation, the Project Management Coordinator would investigate the

Hardship Acquisition Criteria and Documentation

| Hardship Situation  | Supporting Documentation       |
|---|--------------------------------|
| Disability  | Doctor's statement             |
| Deprived health, safety, and welfare conditions                               | Legal records                  |
| Mandatory transfer of employment  | Certified letter from employer |
| Loss of employment  | Certified letter from employer |
| Insufficient funding for estate debt  | Financial statement            |
| Extreme reduction in income   | Income tax returns             |
| Foreclosure or bankruptcy   | Financial statement            |
| Inability to sell property/loss in property value due to vicinity of corridor | Broker's certification         |

property owner's request and prepare a memorandum outlining the results of the investigation and providing a recommendation to the Chief Right-of-Way Agent. The memorandum would also include a cost estimate for property acquisition. The Chief Right-of-Way Agent would make the final decision regarding the approval or denial of the property acquisition. If approved, the Project Management Coordinator would provide a copy of the complete documentation package and letter of approval to the property owner. In the event that the request is not approved, the Project Management Coordinator would provide a letter disclosing the reasons for denial. Generally, few claims have met ADOT's eligibility criteria for hardship acquisitions; therefore, ADOT has generally provided no compensation for such claims.

Damages

Claims for structural damages are evaluated on a case-by-case basis through the Arizona Department

of Administration Risk Management Section. The property owner would initiate the process by immediately reporting property damages to the Risk Management Section in Phoenix. The property owner would then complete and submit form RMO15, "Notice of Claim Against the State of Arizona," to the Risk Management Section and the Office of the Attorney General. The form must be completed with contact information; the date, time, and circumstances of the situation; and the amount of the claim.

After receiving the claim, the Risk Management Section would notify the property owner of the claim number and the adjuster who would be assigned to evaluate the claim. The adjuster would then determine whether the claim would be eligible for compensation and notify the property owner of the claim status.

Broadway Road and 99th Avenue. It is not now known whether the sites could be reconfigured to allow the dairies to remain in operation. Similar to milling companies, these businesses have a high level of capital investment in equipment. Because of the biological nature of the operations, no interruption in operations could be tolerated if relocated. If totally displaced, the dairy operations would be difficult to relocate within the region because of urbanization in surrounding areas. These potential displacements would continue a trend of dairy production moving farther away from the Phoenix metropolitan area.

Action Alternative, Eastern Section

E1 (Preferred) Alternative

The E1 Alternative would displace two businesses in the "other services" category.

No-Action Alternative

Under the No-Action Alternative, no businesses would be displaced or otherwise affected. Over time, however, it is possible that roadway improvements later initiated by local jurisdictions may adversely affect businesses. In addition, increasing future traffic congestion may adversely affect trucking and other transportation-related businesses in the Study Area. The No-Action Alternative would not preclude proposal of a project similar to the proposed action in the future that could, in turn, result in displacements and relocations.

Proximity Impacts on Businesses

In general, the proposed action would benefit nearby businesses by providing improved highway access and would benefit regional businesses by improving regional traffic conditions. Offsetting these benefits would be short-term adverse impacts during construction (see the section, *Temporary Construction Impacts*, beginning on page 4-173).

Retail businesses, restaurants, and some service industries are types of businesses most dependent on visibility. Other types of businesses, particularly those located in the Study Area, are less dependent on "drive-by" customers and

interruptions in its business.<sup>2</sup> If relocated within the region, the regional economic impacts of these business displacements would be minimal.

- The W101 Alternative Western Option would also displace Bay State Milling Company, which has a substantial investment in equipment at its existing site. Bay State Milling Company is a large flour mill serving more than 80 percent of the bakeries, tortilla

factories, and food-service providers in Arizona. The mill requires a site with both truck and rail access for operations. Interruption of operations at the flour mill for possible relocation would have a detrimental effect on this business as well as on the local and regional economies.<sup>3</sup>

- The W101 Alternative Western and Central Options would displace dairy operations on West



tend to be sought out by customers; these are sometimes termed “destination businesses.” For instance, customers of trucking companies, warehouses, wholesale traders, and manufacturers do not frequent these businesses on an impulse—visibility is still important, but less important than it may be to retail trade.

Table 4-15 summarizes those businesses within 300 feet (but outside of the R/W) of the respective action alternatives by business type and number.

Action Alternatives, Western Section

W59 (Preferred) Alternative

As long as access to businesses would remain uninterrupted during the construction period, adverse impacts on the local or regional economies would be minimal. Most businesses are located on relatively well-used arterial and collector streets, and it is reasonable to assume that access would always be provided during the construction period.

Because of the nature of the businesses—predominantly wholesale trade, trucking, and manufacturing—temporary construction impacts from dust, noise, and access changes would be disruptive in the near term, but unlikely to adversely affect the economic viability of the business or industry in the long term. It is also likely that most of these businesses would benefit from the proposed freeway through improved highway access.

W71 Alternative

Because of the nature of businesses within 300 feet of the W71 Alternative, they would not be affected by the W71 Alternative. It is likely that these businesses would benefit from the proposed freeway through improved highway access; therefore, any permanent effects would likely be beneficial.

W101 Alternative and Options

As long as access to the businesses within 300 feet of the W101 Alternative and Options would remain uninterrupted during the construction period, local and regional economies would experience minimal adverse impacts. Because most of these businesses are located on relatively well-used arterial and collector streets, it

Table 4-15 Summary of Businesses within 300 Feet of Action Alternatives

| Action Alternative/<br>Option | Business                           |  |  |  |              |             |               |  |   |                       |              |                                   |                 |       |
|-------------------------------|------------------------------------|--|--|--|--------------|-------------|---------------|--|---|-----------------------|--------------|-----------------------------------|-----------------|-------|
|                               | Accommodation<br>and Food Services | Administrative and Support<br>and Waste Management and<br>Remediation Services | Agriculture, Forestry,<br>Fishing, and Hunting | Arts, Entertainment, and<br>Recreation | Construction | Information | Manufacturing | Other Services (except<br>Public Administration) | Professional, Scientific, and<br>Technical Services | Public Administration | Retail Trade | Transportation and<br>Warehousing | Wholesale Trade | Total |
| Western Section               |                                    |  |  |  |              |             |               |  |   |                       |              |                                   |                 |       |
| W59                           | 7                                  | 1  | 0  | 0                                      | 4            | 0           | 12            | 6  | 9   | 0                     | 7            | 9                                 | 7               | 62    |
| W71                           | 1                                  | 1  | 0  | 0                                      | 4            | 0           | 3             | 1  | 1   | 0                     | 6            | 4                                 | 5               | 26    |
| W101 Western Option           | 4–6 <sup>a</sup>                   | 2–3  | 4  | 0                                      | 2            | 0           | 2–3           | 3–5  | 2–3   | 2                     | 11–13        | 2                                 | 2–3             | 39–43 |
| W101 Central Option           | 2–4                                | 2–3  | 3  | 0                                      | 1            | 0           | 3–4           | 3–5  | 2–3   | 2                     | 7–9          | 1                                 | 1–2             | 30–34 |
| W101 Eastern Option           | 2–4                                | 2–3  | 1  | 0                                      | 1            | 0           | 3–4           | 3–5  | 2–3   | 2                     | 7–9          | 1                                 | 1–2             | 28–32 |
| Eastern Section               |                                    |  |  |  |              |             |               |  |   |                       |              |                                   |                 |       |
| E1                            | 0                                  | 2  | 0  | 1                                      | 1            | 1           | 1             | 8  | 4   | 0                     | 0            | 1                                 | 0               | 19    |

Sources: Maricopa Association of Governments 2012 Business Database

Notes: This table includes businesses within 300 feet of the action alternatives but outside of each respective action alternative’s right-of-way. The Maricopa Association of Governments 2012 Business Database may indicate numerous businesses within one location (address). The “other services” category includes health care and social assistance. The “professional, scientific, and technical services” category includes educational services, finance and insurance, real estate, and rental and leasing.

<sup>a</sup> W101 Alternative and Options include ranges because of design options; totals don’t equal a simple summing of the impacts because the Partial and Full Reconstruction Options would affect land uses differently.

is reasonable to assume that access would always be provided. In addition, with the exception of a drive-in type business, it does not appear that any business revenues would be reduced by temporary dust and noise impacts associated with project construction.

Action Alternative, Eastern Section

E1 (Preferred) Alternative

The businesses within 300 feet of the E1 Alternative are relatively small and would potentially benefit from improved highway access and visibility. The businesses

on Community land, although larger, would also benefit from improved highway access and visibility.

MITIGATION

ADOT Right-of-Way Group Responsibilities

Land acquisition and relocation assistance services for the project shall be available to all individuals in accordance with the Uniform Act, as amended. The implementing regulation for federally funded highway projects is 49 C.F.R. Part 24.

The Uniform Act’s objectives are to:

- provide uniform, fair, and equitable treatment of people whose property is acquired or who are displaced as a result of a federally funded project
- ensure relocation assistance is provided to displaced people to lessen the emotional and financial impact of being displaced
- ensure that no individual or family is displaced unless decent, safe, and sanitary housing is available within the displaced person’s financial means
- improve the housing conditions of displaced people living in substandard housing
- encourage and expedite acquisition by agreement and without coercion

As part of the Uniform Act, ADOT and its consultants and contractors must prevent discrimination in all highway programs and must ensure compliance with Title VI, as amended (42 U.S.C. § 2000d, et seq.). Accordingly, no person can be excluded from participation in, denied the benefits of, or in any other way be subjected to discrimination under any federally funded program or activity because of his or her race, color, or national origin. For this project, all eligible displaced people would receive the same opportunities with regard to services, benefits, and financial aid. To ensure participation, informational meetings would be scheduled in convenient, accessible locations and various times to ensure all interested persons the opportunity to attend.

In accordance with 49 C.F.R. 24.205(c)(2)(ii)(D), whenever possible, minority people would be given reasonable opportunities to relocate to decent, safe, and sanitary replacement housing that is not located in an area of minority population concentration, within their financial means. Any displaced people who may be eligible for government housing assistance would be advised of any requirements related to such government assistance. They would also be notified of the limited duration (42 months) of relocation rental assistance payments.

**Advisory Services**

In addition to being required by law, relocation assistance advisory services are the most important part of a successful relocation program. Such advisory services must be provided to all eligible displaced people, including both residents and business owners.

A displaced person is defined as:

Any person (individual, family, partnership, association or corporation) who moves from real property, or moves personal property from real property as a direct result of (1) the acquisition of the real property, in whole or in part, (2) a written notice from the Agency of its intent to acquire, (3) the initiation of negotiations for the purchase of the real property by the Agency, or (4) a written notice requiring a person to vacate real property for the purpose of rehabilitation or demolition of improvements, provided the displacement is permanent and the property is needed for a Federal or federally assisted program or project [49 C.F.R. Part 24.2(9)].

Relocation assistance advisory services would include one or more personal interviews with each displaced person. Relocation staff would survey each displaced person to determine his or her needs and preferences and would explain relocation benefits and services. The survey would be conducted when the offer is made to purchase the property, or before. After-hours appointments could be arranged to accommodate people who work or who cannot otherwise participate in meetings and counseling held during regular business hours. Information would be provided in a variety of means and languages to meet unique needs of residents and business owners. Advisory services would include:

- determining the needs and preferences of displaced people
- explaining available relocation assistance
- explaining a person’s right to appeal if he or she is not satisfied with an agency decision

- offering and providing transportation to locate replacement housing
- offering other assistance (social services, financial referrals, housing inspection, etc.)
- providing current listings of comparable dwellings for residential displacements and replacement sites for business displacements
- supplying information on other federal and State programs offering assistance
- providing counseling and other assistance to minimize hardship in adjusting to a relocation

To make the relocation process as convenient as possible for residents and businesses, relocation staff would set up an office within the project boundaries. The location of this office would be publicized through various media. Relocation advisory services and counseling could occur at this on-site office or in the displaced person’s residence or business.

**Rental Assistance**

In Arizona, rental assistance housing for eligible residents is provided through the Section 8 program of HUD. In 1975, the City of Phoenix Housing Department implemented the Section 8 program to provide rental assistance for very low-income families, senior citizens, and disabled persons within the city. The program makes housing assistance payments to private landlords on behalf of eligible families. Applicable program regulations include, but are not limited to, 24 C.F.R. Parts 5, 8, and 982. For any displaced person participating in this program, reasonable accommodation would be considered to meet any special needs on a case-by-case basis.

ADOT met with the City of Phoenix Housing Department to gather information on its Section 8 housing program. The Section 8 Housing Choice Voucher Program is the largest federal housing program. The city’s Housing Choice Voucher Program provides housing for more than 5,400 households. Single persons and families of low income who are below the maximum income limit may qualify. These limits are found on



the City of Phoenix Section 8 Web site at <phoenix.gov/housing/finding/qualify/section8/index.html>. Applicants must pass a criminal background check and must not owe any money to any housing program in the United States. The Housing Department stated that, currently, no new Section 8 vouchers are available. A waiting list has been developed for tenants requesting assistance. However, tenants who are currently receiving assistance through the Section 8 program may relocate to preapproved Section 8 replacement housing without any lapse in benefits.

To ensure that an adequate supply of private rental units accepting Section 8 will continue as a relocation resource, ADOT and/or its contractors would maintain a list of housing referrals through ongoing contacts with landlords and property management companies. The addresses of eligible Section 8 units would be provided to displaced households requiring Section 8 housing. Once eligibility is determined, ADOT would partner with the City of Phoenix Housing Department to ensure that those displaced by the project would receive priority on the Section 8 housing waiting list.

**Social Services**

Assistance would be provided to displaced persons in transferring or establishing their social services network (Medicaid waiver; meals-on-wheels; home health services; Maricopa County, State, and/or local social services; etc.) to ensure that these services continue after relocation. Displaced people may not qualify for all social services available. However, relocation advisory services would provide information regarding assistance for which they may qualify.

**Assistance for Disabled and Elderly Persons**

For eligible displaced persons, relocation and supportive staff would identify any special needs (such as proximity to medical and related services, additional packing assistance) as part of the relocation counseling process. ADOT would endeavor to prioritize households with seniors and/or persons with disabilities and would counsel residents to ensure their move meets all their social and geographical needs. It is anticipated that

special assistance would be provided to disabled and elderly people to ease the disturbance and to attempt to complete the relocation process to their satisfaction.

**Housing Standards**

All replacement housing would be decent, safe, and sanitary and would comply with standards set forth in 49 C.F.R. Part 24.2(8). The dwelling would meet applicable housing and/or occupancy codes and would meet all the following criteria:

- is structurally sound, weathertight, and in good repair
- has a safe electrical wiring system adequate for lighting and other devices
- has a heating system capable of sustaining a healthful temperature (approximately 70 degrees Fahrenheit), except in areas where local climatic conditions do not require such a system
- is adequate in size with respect to the number of rooms and area of living needed to accommodate the displaced person (The number of persons occupying each room used for sleeping should not exceed that permitted by local housing codes.)
- includes a well-lighted and ventilated bathroom that provides privacy and contains a sink, a bathtub or shower stall, and a toilet—all in good working order and properly connected to appropriate sources of water and to a sewage drainage system
- in the case of a housekeeping dwelling, includes a kitchen area with a fully usable sink properly connected to potable hot and cold water sources and to a sewage drainage system and with adequate space and utility connections for a stove and refrigerator
- contains unobstructed access to safe, open space at ground level
- in the case of a displaced person with a disability, is free of any barriers that would preclude reasonable ingress, egress, or use of the dwelling by the displaced person (This includes all physical disabilities, not just those attributable to people who are motion impaired.)

**Replacement Housing**

In general, ADOT must assist each household by identifying at least one available comparable replacement dwelling unit. Replacement housing would be provided on a nondiscriminatory basis in compliance with fair housing and other civil rights laws.

A comparable replacement dwelling must be:

- decent, safe, and sanitary
- functionally equivalent to the displacement dwelling (This means it performs the same function and provides the same utility. While a comparable replacement dwelling need not possess every feature of the displacement dwelling, the principal features must be present. Generally, functional equivalency is an objective standard, reflecting the range of purposes for which a dwelling’s various physical features may be used. If every feature is not present in the comparable replacement dwelling, ADOT may consider reasonable tradeoffs for specific features when the replacement unit is equal to or better than the displacement dwelling.)
- adequate in size to accommodate the occupants
- in an area not subject to unreasonable environmental conditions
- in a location generally not less desirable than the location of the displacement dwelling with respect to public utilities, commercial and public facilities, and reasonable accessibility to the person’s place of employment
- on a site that is typical in size for residential use, with normal site improvements, including customary landscaping (The site need not include special improvements such as swimming pools, greenhouses, or other major exterior attributes not necessary for the functional equivalency of the replacement dwelling.)
- be currently available to the displaced person on the private market, except as provided under rules for subsidized housing
- reflect similar governmental housing assistance for a person receiving such assistance before displacement

(In such cases, any requirements of the governmental housing assistance program relating to the size of the replacement dwelling shall apply.)

- within the financial means of the displaced person, as identified in 49 C.F.R. Part 24.2(6)(viii)

ADOT would assist displaced residents in finding replacement housing; however, they have the right to find their own. If the unit does not meet the decent, safe, and sanitary standards described above, the resident would not be eligible to receive a replacement housing assistance payment for that unit.

**Displaced Businesses**

Moving costs incurred by business owners or tenants may be reimbursed on the basis of reasonable, necessary, and actual eligible moving costs and related expenses or a fixed payment. Actual, reasonable moving expenses may be paid when the move is performed by a professional mover or by the business owner or tenant (a self-move). A small business (up to 500 employees) may be reimbursed for eligible expenses actually incurred in relocating and reestablishing the enterprise at a replacement site.

The relocation agent would provide a complete and detailed explanation of reimbursable moving and related expenses when the offer to purchase the property is made or, in the case of tenant occupants, as soon as reasonably possible. All occupants would be given a written notice to vacate at least 90 days before the required date to complete the move.

**Summary**

All displaced persons are given assistance on an individual basis according to ADOT policy, State of Arizona statutes, and the Uniform Act, as amended. Documentation is kept on all relocation assistance, giving the agency an accurate account of relocation activities. This documentation is subject to review by ADOT management personnel and by FHWA to ensure that all displaced persons have received fair and equitable treatment.

ADOT, or a consultant employed by ADOT, would conduct one-on-one interviews to determine special needs of displaced persons. At that time, the relocation agent would determine whether the displaced person is participating in the City of Phoenix Section 8 housing program. Additionally, the relocation agent would determine whether the displaced person would require special accommodations that may take additional time, or any additional concerns attributable to work, schools, shopping, transportation, or church affiliation.

ADOT and/or its consultants would ensure that replacement housing opportunities are available for households with disabled residents with special housing requirements. ADOT routinely addresses such needs by making modifications to public housing units to provide accessibility. It would also work with private landlords to identify accessible units in the private housing market. A disabled person is one who has physical or mental impairment that limits one or more major life activities. A record of such an impairment, or being regarded as having such an impairment, would be documented in the resident’s file.

Displaced business owners or tenants would also be interviewed. Eligible moving cost expense reimbursements would be explained according to the specific circumstances. The displaced business owners or tenants would choose the desired options to fit their particular operations.

Displaced persons have the right to appeal if they believe their eligibility for relocation assistance advisory services or the amount of a relocation payment was not properly determined. Such persons also have the right to be represented by legal counsel or other representatives during an appeal, but solely at their own expense.

For more information, visit the FHWA Web site at: [fhwa.dot.gov/real\\_estate/practitioners/uniform\\_act/](http://fhwa.dot.gov/real_estate/practitioners/uniform_act/)

Visit the ADOT Web site at: [azdot.gov/business/RightofWay\\_Properties](http://azdot.gov/business/RightofWay_Properties)

Visit the project Web site at: [azdot.gov/projects/phoenix-metro-area/loop-202-south-mountain-freeway](http://azdot.gov/projects/phoenix-metro-area/loop-202-south-mountain-freeway)

Contact the ADOT Right-of-Way Group at: (602) 712-6341 (Merrisa Marin, Right-of-Way Coordinator)  
  
(602) 712-7710 (Reggie Rector, Right-of-Way Coordinator)

Prior to the ROD, ADOT would consider protective and hardship acquisition on a case-by-case basis in accordance with criteria outlined in the ADOT *Right-of-Way Procedures Manual* (2011a).

ADOT would coordinate with the local jurisdictions, MAG, and Valley Metro to identify opportunities to use excess R/W, whenever possible, for future park-and-ride lots and related public facilities. Costs associated with building these facilities would be the responsibility of the City of Phoenix, MAG, and/or Valley Metro.

**CONCLUSIONS**

Displacements resulting from implementation of any of the action alternatives would involve, predominantly, single-family homes. In the Western Section, implementation of the W59 (Preferred) Alternative would displace substantially fewer single-family residential properties than would implementation of the W71 and W101 Alternatives, in part because local jurisdictions have accommodated the proposed action along the alignment of the W59 Alternative in their planning (46 displaced existing single-family residences when compared with 705 and between 631 and 890 displaced existing single-family residences for the W71 Alternative and W101 Alternative and Options, respectively). However, when including multifamily housing unit displacements, the number of displacements with the W59 Alternative increases to 727 units (greater than the W71 Alternative and W101 Alternative Western Option and lower than the other action alternatives in the Western Section). The E1 (Preferred) Alternative in the Eastern Section would displace an



estimated 112 existing single-family homes. Through the EIS process, alignment identification and concept design of the action alternatives have been modified to reduce freeway footprint-related impacts. The number of displacements reflected in this document, while consistent with a project the magnitude of the proposed action located in a growing region, is subject to change as ADOT continues to refine the proposed freeway design to enhance freeway operation and to reduce impacts and costs.

Any of the action alternatives would cause economic impacts on businesses, ranging from beneficial (a result of improved freeway access for transportation companies, for example) to adverse (displacements). Projected business displacements would vary by

action alternative, and while implementation of the W59 Alternative would displace a greater number of businesses than would the other action alternatives in the Western Section (42 businesses compared with only 14 to 30 businesses), more employees could be adversely affected by implementation of the W101 Alternative than by the W59 Alternative. With the W59 Alternative, manufacturing, retail trade, and transportation and warehousing would account for over one-half of the displacements. No businesses would be displaced by the E1 Alternative. Although displacement could be an adverse impact on a given business, it would not necessarily be an adverse impact on the economy. Assuming demand persists for the types of services provided by displaced businesses, activity should

continue at new locations, especially when reasonably near existing locations. Because of the size of the Phoenix regional economy and because of the availability of business sites nearby, business displacements should be able to be reasonably mitigated and the regional economy unaffected.

In the region, ADOT and FHWA have regularly used and consistently applied the required acquisition and relocation assistance program afforded to affected residents. The program would effectively mitigate relocation impacts.

ECONOMIC IMPACTS

EXISTING CONDITIONS

Because of the growing economic intensification of the region, local governments are concerned about the volume of developable land that could be removed from the tax base as a result of implementation of one of the action alternatives. (A 2004 City of Phoenix report demonstrated that the levels of tax revenue impacts and other revenue impacts can be measured in the millions of dollars.) Consideration of major tax revenue impacts that would result from the action alternatives was used in a manner similar to that applied in the City of Phoenix report and is discussed in this section.

Table 4-16 summarizes the acreage of land uses that would be affected by the action alternatives and that would be expected to generate measurable tax revenues. The table was generated assuming the following land uses would not generate substantial tax revenues:

- *Institutional* lands are generally for public purposes, are not subject to property taxes, and do not generate sales tax revenues.
- *Park* lands are generally public lands and are consequently not in the tax base.
- *Transportation* land accounts for existing public R/W for streets, roads, and highways, which are not included in the tax base.
- *Water surface or riverbed* accounts for the channel and immediate floodplain of the Salt River.

Of the affected municipalities, the City of Phoenix would have the most acreage of taxable land at stake with respect to the proposed action. In the Western Section, the W59 Alternative would need the least amount of taxable land.

Most of the impact on the City of Tolleson’s taxable land base would stem from the W101 Alternative and Options, where primarily agricultural, industrial, and vacant land would be affected.

Impacts on taxable land in Avondale would occur with the W101 Alternative and Options. The impacts would be approximately double in Avondale if full reconstruction

Table 4-16 Acreage of Taxable Land Uses by Jurisdiction, Action Alternatives

| Action Alternative/Option | Land Use             |            |            |                           |                         |        | Total       |
|---------------------------|----------------------|------------|------------|---------------------------|-------------------------|--------|-------------|
|                           | Agricultural         | Commercial | Industrial | Single-family Residential | Multifamily Residential | Vacant |             |
| Phoenix                   |                      |            |            |                           |                         |        |             |
| Western Section           |                      |            |            |                           |                         |        |             |
| W59                       | 546                  | 8          | 158        | 44                        | 20                      | 118    | 894         |
| W71                       | 488                  | —          | 209        | 295                       | — <sup>a</sup>          | 41     | 1,033       |
| W101 Western Option       | 753–755 <sup>b</sup> | 23–26      | 43         | 182                       | —                       | 54     | 1,057–1,058 |
| W101 Central Option       | 667–669              | 1–4        | 43         | 228                       | —                       | 55     | 996–997     |
| W101 Eastern Option       | 617–619              | 1–4        | 43         | 247                       | —                       | 101    | 1,011–1,012 |
| Eastern Section           |                      |            |            |                           |                         |        |             |
| E1                        | 162                  | 1          | 10         | 100                       | —                       | 442    | 715         |
| Tolleson                  |                      |            |            |                           |                         |        |             |
| Western Section           |                      |            |            |                           |                         |        |             |
| W59                       | —                    | —          | —          | —                         | —                       | —      | —           |
| W71                       | —                    | —          | —          | —                         | —                       | —      | —           |
| W101 Western Option       | 44–52                | 8–16       | 117–129    | —                         | 0–1                     | 0–2    | 177–192     |
| W101 Central Option       | 57–65                | 8–16       | 111–123    | —                         | 0–1                     | 32–34  | 216–231     |
| W101 Eastern Option       | 57–65                | 8–16       | 111–123    | —                         | 0–1                     | 32–34  | 216–231     |
| Eastern Section           |                      |            |            |                           |                         |        |             |
| E1                        | —                    | —          | —          | —                         | —                       | —      | —           |
| Avondale                  |                      |            |            |                           |                         |        |             |
| Western Section           |                      |            |            |                           |                         |        |             |
| W59                       | —                    | —          | —          | —                         | —                       | —      | —           |
| W71                       | —                    | —          | —          | —                         | —                       | —      | —           |
| W101 Western Option       | —                    | 0–5        | —          | —                         | —                       | —      | 0–5         |
| W101 Central Option       | —                    | 0–5        | —          | —                         | —                       | —      | 0–5         |
| W101 Eastern Option       | —                    | 0–5        | —          | —                         | —                       | —      | 0–5         |
| Eastern Section           |                      |            |            |                           |                         |        |             |
| E1                        | —                    | —          | —          | —                         | —                       | —      | —           |

Source: analysis of aerial imagery (2009, 2010, 2013)  
<sup>a</sup> not applicable  
<sup>b</sup> W101 Alternative and Options include ranges because of design options; totals do not equal a simple summing of the impacts because the Partial and Full Reconstruction Options would affect land uses differently.



of the I-10 (Papago Freeway)/SR 101L (Agua Fria Freeway) system traffic interchange were to occur.

ENVIRONMENTAL CONSEQUENCES

Fiscal Impact Economic Assumptions

The primary source of tax generation data used in the analysis was from the Maricopa County Assessor’s database. The analysis employed full cash values and limited cash values because those values are used directly in property tax calculations and are readily available from the County Assessor. Market values were used to calculate the full and limited cash values, but the formulas are complex and market values are not available in the Assessor’s database.

The average full and limited cash values were determined by using a sample set of each property type from parcels within each of the action alternatives. Commercial land was assumed to include 50 percent retail and 50 percent office. Industrial land was assumed to be 50 percent manufacturing and 50 percent warehouse/distribution.

For each type of land use considered, ten samples of representative property values (land and improvement) were randomly drawn from the interactive map and database using a “point-and-click” method. Because these samples were randomly<sup>4</sup> selected, they represent businesses from all parts of the county.

The assessment ratio for each property type was updated with 2013 ratios, as shown in Table 4-17. Assessment ratios for commercial properties were assumed to be 20 percent, the ratio for 2011, because the project would not be built prior to that year and the long-term assessment ratio beyond 2011 is scheduled to be 20 percent. Vacant land was valued to reflect its zoning.

The tax levy applied to calculate property tax impacts was updated with the 2013 levy and broken into the primary and secondary levies. Because each action alternative overlaps multiple tax districts, the most common tax district in each alignment was used to determine the average primary and secondary levies to be applied to calculate primary and secondary taxes per acre. Note that the most common tax district for each alignment included a City of Phoenix levy, even on the

Table 4-17 Land Valuation Assumptions Used to Estimate Property Tax Impacts Resulting from Right-of-way Acquisition

| Assumption   | Land Use     |            |            |                           |                         |        |
|--|--------------|------------|------------|---------------------------|-------------------------|--------|
|  | Agricultural | Commercial | Industrial | Single-family Residential | Multifamily Residential | Vacant |
| Land valuation assumptions for estimating property tax impacts |              |            |            |                           |                         |        |
| Market value   |              |            |            |                           |                         |        |
| Full cash value for tax purposes (80% of market value, \$)     | 703          | 392,901    | 366,400    | 118,100                   | 71,700                  | 15,770 |
| Limited value (95% of full cash value, \$)                     | 606          | 324,138    | 274,039    | 107,051                   | 64,992                  | 13,065 |
| Assessment ratio   | 0.16         | 0.20       | 0.20       | 0.10                      | 0.10                    | 0.16   |
| Assessed valuation for primary tax levies (\$)                 | 97           | 64,828     | 54,808     | 10,705                    | 6,499                   | 2,090  |
| Assessed valuation for secondary tax levies (\$)               | 112          | 78,580     | 73,280     | 11,810                    | 7,170                   | 2,523  |
| Primary tax levy (\$ per \$100 of assessed value)              |              |            |            |                           |                         |        |
| Phoenix  | 11.15        | 11.15      | 11.15      | 11.15                     | 11.15                   | 11.15  |
| Avondale   | 10.47        | 10.47      | 10.47      | 10.47                     | 10.47                   | 10.47  |
| Tolleson   | 11.47        | 11.47      | 11.47      | 11.47                     | 11.47                   | 11.47  |
| Secondary tax levy (\$ per \$100 of assessed value)            |              |            |            |                           |                         |        |
| Phoenix  | 6.98         | 6.98       | 6.98       | 6.98                      | 6.98                    | 6.98   |
| Avondale   | 7.65         | 7.65       | 7.65       | 7.65                      | 7.65                    | 7.65   |
| Tolleson   | 8.61         | 8.61       | 8.61       | 8.61                      | 8.61                    | 8.61   |
| Primary taxes per acre   |              |            |            |                           |                         |        |
| Phoenix  | 11           | 7,230      | 6,113      | 1,194                     | 725                     | 233    |
| Avondale   | 10           | 6,791      | 5,741      | 1,121                     | 681                     | 219    |
| Tolleson   | 11           | 7,434      | 6,285      | 1,228                     | 745                     | 240    |
| Secondary taxes per acre                                       |              |            |            |                           |                         |        |
| Phoenix  | 8            | 5,487      | 5,117      | 825                       | 501                     | 176    |
| Avondale   | 9            | 6,009      | 5,604      | 903                       | 548                     | 193    |
| Tolleson   | 10           | 6,765      | 6,309      | 1,017                     | 617                     | 217    |
| Total real and personal property taxes (\$/acre)               |              |            |            |                           |                         |        |
| Phoenix  | 19           | 12,717     | 11,230     | 2,019                     | 1,226                   | 409    |
| Avondale   | 19           | 12,800     | 11,345     | 2,024                     | 1,229                   | 412    |
| Tolleson   | 21           | 14,199     | 12,594     | 2,245                     | 1,362                   | 457    |

Table 4-18 Reductions in Local Annual Property Tax Revenues Resulting from Right-of-way Acquisition, Existing Land Uses, Action Alternatives

| Action Alternative/<br>Option | Land Use      |                              |                       |                              |                            |               | Total                 |
|-------------------------------|---------------|------------------------------|-----------------------|------------------------------|----------------------------|---------------|-----------------------|
|                               | Agricultural  | Commercial                   | Industrial            | Single-family<br>Residential | Multifamily<br>Residential | Vacant        |                       |
| Phoenix                       |               |                              |                       |                              |                            |               |                       |
| Western Section               |               |                              |                       |                              |                            |               |                       |
| W59                           | \$10,200      | \$100,900                    | \$1,768,700           | \$89,000                     | \$24,800                   | \$48,100      | \$2,041,700           |
| W71                           | 9,000         | —                            | 2,348,500             | 594,700                      | — <sup>a</sup>             | 16,700        | 2,968,900             |
| W101 Western Option           | 14,100        | 286,300–328,800 <sup>b</sup> | 483,600               | 367,000                      | —                          | 22,300        | 1,173,300–1,215,800   |
| W101 Central Option           | 12,400–12,500 | 8,700–51,200                 | 483,200               | 460,300                      | —                          | 22,400        | 987,100–1,029,500     |
| W101 Eastern Option           | 11,500–11,600 | 8,700–51,200                 | 479,300               | 497,900                      | —                          | 41,300        | 1,038,800–1,081,200   |
| Eastern Section               |               |                              |                       |                              |                            |               |                       |
| E1                            | \$3,000       | \$10,600                     | \$114,100             | \$202,600                    | —                          | \$180,900     | \$511,200             |
| Tolleson                      |               |                              |                       |                              |                            |               |                       |
| Western Section               |               |                              |                       |                              |                            |               |                       |
| W59                           | —             | —                            | —                     | —                            | —                          | —             | —                     |
| W71                           | —             | —                            | —                     | —                            | —                          | —             | —                     |
| W101 Western Option           | \$800–1,000   | \$99,000–205,700             | \$1,318,100–1,448,500 | \$400                        | \$0–700                    | \$0–700       | \$1,525,000–1,550,300 |
| W101 Central Option           | 1,000–1,200   | 99,000–205,700               | 1,245,800–1,376,200   | 400                          | 0–700                      | 13,000–13,800 | 1,465,900–1,491,300   |
| W101 Eastern Option           | 1,000–1,200   | 99,000–205,700               | 1,245,800–1,376,200   | 400                          | 0–700                      | 13,000–13,800 | 1,465,900–1,491,300   |
| Eastern Section               |               |                              |                       |                              |                            |               |                       |
| E1                            | —             | —                            | —                     | —                            | —                          | —             | —                     |
| Avondale                      |               |                              |                       |                              |                            |               |                       |
| Western Section               |               |                              |                       |                              |                            |               |                       |
| W59                           | —             | —                            | —                     | —                            | —                          | —             | —                     |
| W71                           | —             | —                            | —                     | —                            | —                          | —             | —                     |
| W101 Western Option           | —             | \$0–65,400                   | —                     | —                            | —                          | —             | \$0–65,400            |
| W101 Central Option           | —             | 0–65,400                     | —                     | —                            | —                          | —             | 0–65,400              |
| W101 Eastern Option           | —             | 0–65,400                     | —                     | —                            | —                          | —             | 0–65,400              |
| Eastern Section               |               |                              |                       |                              |                            |               |                       |
| E1                            | —             | —                            | —                     | —                            | —                          | —             | —                     |

<sup>a</sup> not applicable  
<sup>b</sup> W101 Alternative and Options include ranges because of design options; totals do not equal a simple summing of the impacts because the Partial and Full Reconstruction Options would affect land uses differently.

W71 and W101 Alternatives. For illustration purposes, the average levy was calculated for Avondale and Tolleson and included their respective City levies. The calculations show the impact on Avondale and Tolleson if all the properties falling within their respective city boundaries included a City levy from one of these cities.

Property Taxes, Existing Conditions

Table 4-18 presents estimates of reductions (in 2013 dollars) in property tax revenues by type of land use that could be expected by each jurisdiction as a result of each of the action alternatives and options. The estimates are based on existing land uses, land values, and tax rates. Thus, the extent of existing taxable land uses identified in Table 4-16 were both valued and then assessed at the rates shown in Table 4-17 to calculate the loss in tax revenues (Table 4-18) that would reflect the loss of taxable land from tax rolls as a result of acquisition of R/W for the proposed action.

For Phoenix, under existing conditions, the W71 Alternative would create the greatest adverse impact on annual property tax revenues, followed by the W101 Alternative and Options. It should be noted, however, that any impacts on property tax revenues from any of the action alternatives would account for approximately 1 percent of the overall primary and secondary property tax revenues accruing to the City of Phoenix (City of Phoenix 2013).

Although existing conditions reflect a less developed area surrounding the W101 Alternative, the City of Phoenix anticipates that future development would be as intense around the W101 Alternative as it would be along the W59 and W71 Alternatives. The City of Phoenix’s reduction in annual property tax revenues under the E1 Alternative, based on existing land uses, is estimated to be \$511,200.

The City of Tolleson would experience reductions in property tax revenues from the W101 Alternative and Options, which would create adverse impacts. These impacts would range from about \$1.5 million to about \$1.6 million per year, depending on the option of the W101 Alternative considered. The impacts would account for approximately 25 percent of Tolleson’s



existing annual primary property tax revenues (City of Tolleson 2012), a substantial loss for the small community. It should be noted that these percentages apply to the City’s General Fund discretionary revenues. Some additional property tax revenues are dedicated for existing debt service. These funds provide for important social and community services in Tolleson such as public safety, highways and streets, economic development, culture and recreation, and health and welfare. The impact of property tax reductions on minority populations in Tolleson is referenced in the *Environmental Justice and Title VI* section.

The impact on the City of Avondale’s property tax revenues would depend on whether the W101 Alternative and Options have the I-10 (Papago Freeway)/SR 101L system traffic interchange partially reconstructed or fully reconstructed. With partial reconstruction, there would be no impacts on Avondale’s tax revenues. With full reconstruction, the property tax revenue impacts would account for less than 1 percent of Avondale’s existing annual property tax revenues (City of Avondale 2013).

**Sales Taxes on Retail Sales, Existing Conditions**

Retail sales are primarily generated from enterprises in commercial and industrial land uses. Table 4-19 shows assumptions regarding retail sales. Along with the local option sales tax rate of 2.5 percent in Avondale and Tolleson, these assumptions were used to calculate retail sales tax revenue on a per acre basis. Table 4-20 shows estimates of reductions (in 2013 dollars) in annual sales tax revenues that could be expected with the purchase of the roadway R/W, assuming existing land use and tax rates, for each action alternative, by jurisdiction.

For Phoenix, the W59 (Preferred) and W71 Alternatives would have the highest level of annual impact. Overall, the potential impacts on Phoenix’s existing retail sales tax revenues would be relatively small compared with the City’s total sales tax revenues, accounting for less than 0.5 percent regardless of the action alternative considered.

**Table 4-19** Assumptions Used to Estimate Retail Sales Tax Impacts Resulting from Right-of-way Acquisition

| Assumption  | Land Use       |            |            |                           |                         |        |
|---|----------------|------------|------------|---------------------------|-------------------------|--------|
|   | Agricultural   | Commercial | Industrial | Single-family Residential | Multifamily Residential | Vacant |
| Retail sales tax assumptions                          |                |            |            |                           |                         |        |
| Retail sales generation (\$ per building square foot) | — <sup>a</sup> | 250        | 35         | —                         | —                       | —      |
| Floor area ratio                                      | —              | 0.23       | 0.31       | —                         | —                       | —      |
| Retail sales generation (\$ per acre)                 | —              | 2,504,700  | 472,600    | —                         | —                       | —      |
| Local tax rate <sup>b</sup>                           |                |            |            |                           |                         |        |
| Phoenix   | 2.0%           | 2.0%       | 2.0%       | 2.0%                      | 2.0%                    | 2.0%   |
| Avondale  | 2.5%           | 2.5%       | 2.5%       | 2.5%                      | 2.5%                    | 2.5%   |
| Tolleson  | 2.5%           | 2.5%       | 2.5%       | 2.5%                      | 2.5%                    | 2.5%   |
| Retail sales tax generation (\$/acre)                 |                |            |            |                           |                         |        |
| Phoenix   | —              | \$50,100   | \$9,500    | —                         | —                       | —      |
| Avondale  | —              | 62,600     | 11,800     | —                         | —                       | —      |
| Tolleson  | —              | 62,600     | 11,800     | —                         | —                       | —      |

<sup>a</sup> not applicable    <sup>b</sup> Rate represents the local option sales tax, whose revenues are allocated directly to the municipality.

For Tolleson, the W101 Alternative and Options would result in substantial adverse impacts on retail sales tax revenues, ranging from about \$1.9 million to \$2.4 million per year, depending on the option considered. That level of impact would account for about 17 to 21 percent of the City’s existing total annual revenues from retail sales taxes, depending on the action alternative considered (City of Tolleson 2012).

The adverse impacts on Avondale associated with the W101 Alternative and Options would be approximately \$322,000 per year. As a fraction of the City’s existing total annual revenue from retail sales taxes, that level of impact would account for less than 1 percent (City of Avondale 2013).

**Tax Revenue Impacts, Future Land Uses**

Although the recent economic downturn has created a slow-growth development context, historic and projected long-term growth rates in the region invite consideration of how tax revenue impacts might change under future

land use conditions. Indeed, this was the center of the City of Phoenix’s concerns regarding the proposed action alternatives.

Tables 4-21 and 4-22 show future land use estimates and taxable acreage for the three jurisdictions, respectively. For analysis purposes, these estimates are assumed to reflect built-out conditions as they might exist from 2025 through 2035. The tables reveal a shift from agricultural and other low-intensity land uses to commercial, industrial, and residential development. Overall, no substantial changes in the taxable land base are anticipated between the current period and future conditions. The increasing intensity of land use, however, creates greater tax revenue impacts.

**Property Tax Revenues, Future Land Uses**

Table 4-23 shows projected impacts on annual property tax revenues (in 2013 dollars) for land within the action alternatives’ R/W, assuming future land use and the tax

Table 4-20 Reductions in Annual Retail Sales Tax Revenues Resulting from Right-of-way Acquisition, Existing Land Uses, Action Alternatives

| Action Alternative/Option | Land Use       |                                  |                       |                           |                         |        | Total                 |
|---------------------------|----------------|----------------------------------|-----------------------|---------------------------|-------------------------|--------|-----------------------|
|                           | Agricultural   | Commercial                       | Industrial            | Single-family Residential | Multifamily Residential | Vacant |                       |
| Phoenix                   |                |                                  |                       |                           |                         |        |                       |
| Western Section           |                |                                  |                       |                           |                         |        |                       |
| W59                       | — <sup>a</sup> | \$397,400                        | \$1,488,800           | —                         | —                       | —      | \$1,886,200           |
| W71                       | —              | —                                | 1,976,900             | —                         | —                       | —      | 1,976,900             |
| W101 Western Option       | —              | 1,127,900–1,295,200 <sup>b</sup> | 407,100               | —                         | —                       | —      | 1,535,000–1,702,300   |
| W101 Central Option       | —              | 34,300–201,600                   | 406,700               | —                         | —                       | —      | 441,000–608,300       |
| W101 Eastern Option       | —              | 34,300–201,600                   | 403,500               | —                         | —                       | —      | 437,800–605,100       |
| Eastern Section           |                |                                  |                       |                           |                         |        |                       |
| E1                        | —              | \$41,600                         | \$96,100              | —                         | —                       | —      | \$137,700             |
| Tolleson                  |                |                                  |                       |                           |                         |        |                       |
| Western Section           |                |                                  |                       |                           |                         |        |                       |
| W59                       | —              | —                                | —                     | —                         | —                       | —      | —                     |
| W71                       | —              | —                                | —                     | —                         | —                       | —      | —                     |
| W101 Western Option       | —              | \$487,600–1,013,000              | \$1,386,900–1,524,100 | —                         | —                       | —      | \$2,011,700–2,399,900 |
| W101 Central Option       | —              | 487,648–1,013,000                | 1,310,800–1,448,100   | —                         | —                       | —      | 1,935,700–2,323,800   |
| W101 Eastern Option       | —              | 487,648–1,013,000                | 1,310,800–1,448,100   | —                         | —                       | —      | 1,935,700–2,323,800   |
| Eastern Section           |                |                                  |                       |                           |                         |        |                       |
| E1                        | —              | —                                | —                     | —                         | —                       | —      | —                     |
| Avondale                  |                |                                  |                       |                           |                         |        |                       |
| Western Section           |                |                                  |                       |                           |                         |        |                       |
| W59                       | —              | —                                | —                     | —                         | —                       | —      | —                     |
| W71                       | —              | —                                | —                     | —                         | —                       | —      | —                     |
| W101 Western Option       | —              | \$0–322,100                      | —                     | —                         | —                       | —      | \$0–322,100           |
| W101 Central Option       | —              | 0–322,100                        | —                     | —                         | —                       | —      | 0–322,100             |
| W101 Eastern Option       | —              | 0–322,100                        | —                     | —                         | —                       | —      | 0–322,100             |
| Eastern Section           |                |                                  |                       |                           |                         |        |                       |
| E1                        | —              | —                                | —                     | —                         | —                       | —      | —                     |

<sup>a</sup> not applicable

<sup>b</sup> W101 Alternative and Options include ranges because of design options; totals do not equal a simple summing of the impacts because the Partial and Full Reconstruction Options would affect land uses differently.



Table 4-21 Estimated Acreage of Future Study Area Land Uses, Action Alternatives

| Action Alternative/<br>Option | Land Use       |            |                      |        |                           |                         |            |                |        |                            | Total       |
|-------------------------------|----------------|------------|----------------------|--------|---------------------------|-------------------------|------------|----------------|--------|----------------------------|-------------|
|                               | Agricultural   | Commercial | Industrial           | Public | Single-family Residential | Multifamily Residential | Open Space | Transportation | Vacant | Water Surface or River Bed |             |
| Phoenix                       |                |            |                      |        |                           |                         |            |                |        |                            |             |
| Western Section               |                |            |                      |        |                           |                         |            |                |        |                            |             |
| W59                           | — <sup>a</sup> | 372        | 190                  | —      | 120                       | 181                     | 72         | —              | —      | —                          | 935         |
| W71                           | —              | 147        | 223                  | —      | 650                       | —                       | 41         | —              | —      | —                          | 1,061       |
| W101 Western Option           | —              | 214        | 103–108 <sup>b</sup> | —      | 742                       | 3                       | 19         | 3–4            | —      | —                          | 1,084–1,090 |
| W101 Central Option           | —              | 141        | 77–82                | —      | 786                       | —                       | 19         | 3–4            | —      | —                          | 1,026–1,032 |
| W101 Eastern Option           | —              | 141        | 76–81                | —      | 802                       | —                       | 19         | 3–4            | —      | —                          | 1,041–1,047 |
| Eastern Section               |                |            |                      |        |                           |                         |            |                |        |                            |             |
| E1                            | —              | 70         | 11                   | 2      | 373                       | 15                      | 32         | 380            | —      | —                          | 883         |
| Tolleson                      |                |            |                      |        |                           |                         |            |                |        |                            |             |
| Western Section               |                |            |                      |        |                           |                         |            |                |        |                            |             |
| W59                           | —              | —          | —                    | —      | —                         | —                       | —          | —              | —      | —                          | —           |
| W71                           | —              | —          | —                    | —      | —                         | —                       | —          | —              | —      | —                          | —           |
| W101 Western Option           | —              | 62–69      | 91–98                | —      | 54                        | —                       | —          | —              | —      | —                          | 207–221     |
| W101 Central Option           | —              | 62–69      | 128–136              | —      | 52                        | —                       | —          | —              | —      | —                          | 242–257     |
| W101 Eastern Option           | —              | 62–69      | 128–136              | —      | 52                        | —                       | —          | —              | —      | —                          | 242–257     |
| Eastern Section               |                |            |                      |        |                           |                         |            |                |        |                            |             |
| E1                            | —              | —          | —                    | —      | —                         | —                       | —          | —              | —      | —                          | —           |
| Avondale                      |                |            |                      |        |                           |                         |            |                |        |                            |             |
| Western Section               |                |            |                      |        |                           |                         |            |                |        |                            |             |
| W59                           | —              | —          | —                    | —      | —                         | —                       | —          | —              | —      | —                          | —           |
| W71                           | —              | —          | —                    | —      | —                         | —                       | —          | —              | —      | —                          | —           |
| W101 Western Option           | —              | 0–6        | —                    | —      | —                         | —                       | —          | 0–10           | —      | —                          | 0–16        |
| W101 Central Option           | —              | 0–6        | —                    | —      | —                         | —                       | —          | 0–10           | —      | —                          | 0–16        |
| W101 Eastern Option           | —              | 0–6        | —                    | —      | —                         | —                       | —          | 0–10           | —      | —                          | 0–16        |
| Eastern Section               |                |            |                      |        |                           |                         |            |                |        |                            |             |
| E1                            | —              | —          | —                    | —      | —                         | —                       | —          | —              | —      | —                          | —           |

Sources: City of Tolleson, 2005; City of Phoenix, 2001; City of Avondale, 2002; Maricopa County, 1997

<sup>a</sup> not applicable    <sup>b</sup> W101 Alternative and Options include ranges because of design options; totals do not equal a simple summing of the impacts because the Partial and Full Reconstruction Options would affect land uses differently.

Table 4-22 Acreage of Future Taxable Land Uses, Action Alternatives

| Action Alternative/<br>Option | Land Use       |            |                      |                              |                            |        | Total       |
|-------------------------------|----------------|------------|----------------------|------------------------------|----------------------------|--------|-------------|
|                               | Agricultural   | Commercial | Industrial           | Single-family<br>Residential | Multifamily<br>Residential | Vacant |             |
| Phoenix                       |                |            |                      |                              |                            |        |             |
| Western Section               |                |            |                      |                              |                            |        |             |
| W59                           | — <sup>a</sup> | 372        | 190                  | 120                          | 181                        | —      | 863         |
| W71                           | —              | 147        | 223                  | 650                          | —                          | —      | 1,020       |
| W101 Western Option           | —              | 214        | 103–108 <sup>b</sup> | 742                          | 3                          | —      | 1,062–1,067 |
| W101 Central Option           | —              | 141        | 77–82                | 786                          | —                          | —      | 1,004–1,009 |
| W101 Eastern Option           | —              | 141        | 76–81                | 802                          | —                          | —      | 1,019–1,024 |
| Eastern Section               |                |            |                      |                              |                            |        |             |
| E1                            | —              | 70         | 11                   | 373                          | 15                         | —      | 469         |
| Tolleson                      |                |            |                      |                              |                            |        |             |
| Western Section               |                |            |                      |                              |                            |        |             |
| W59                           | —              | —          | —                    | —                            | —                          | —      | —           |
| W71                           | —              | —          | —                    | —                            | —                          | —      | —           |
| W101 Western Option           | —              | 62–69      | 91–98                | 54                           | —                          | —      | 207–221     |
| W101 Central Option           | —              | 62–69      | 128–136              | 52                           | —                          | —      | 242–257     |
| W101 Eastern Option           | —              | 62–69      | 128–136              | 52                           | —                          | —      | 242–257     |
| Eastern Section               |                |            |                      |                              |                            |        |             |
| E1                            | —              | —          | —                    | —                            | —                          | —      | —           |
| Avondale                      |                |            |                      |                              |                            |        |             |
| Western Section               |                |            |                      |                              |                            |        |             |
| W59                           | —              | —          | —                    | —                            | —                          | —      | —           |
| W71                           | —              | —          | —                    | —                            | —                          | —      | —           |
| W101 Western Option           | —              | 0–6        | —                    | —                            | —                          | —      | 0–6         |
| W101 Central Option           | —              | 0–6        | —                    | —                            | —                          | —      | 0–6         |
| W101 Eastern Option           | —              | 0–6        | —                    | —                            | —                          | —      | 0–6         |
| Eastern Section               |                |            |                      |                              |                            |        |             |
| E1                            | —              | —          | —                    | —                            | —                          | —      | —           |

<sup>a</sup> not applicable  
<sup>b</sup> W101 Alternative and Options include ranges because of design options; totals do not equal a simple summing of the impacts because the Partial and Full Reconstruction Options would affect land uses differently.



**Table 4-23** Reductions in Local Annual Property Tax Revenues Resulting from Right-of-way Acquisition, Future Land Uses, Action Alternatives

| Action Alternative/Option | Land Use       |                                  |                              |                           |                         |        | Total                 |
|---------------------------|----------------|----------------------------------|------------------------------|---------------------------|-------------------------|--------|-----------------------|
|                           | Agricultural   | Commercial                       | Industrial                   | Single-family Residential | Multifamily Residential | Vacant |                       |
| Phoenix                   |                |                                  |                              |                           |                         |        |                       |
| Western Section           |                |                                  |                              |                           |                         |        |                       |
| W59                       | — <sup>a</sup> | \$1,254,600                      | \$3,227,700                  | \$1,262,200               | \$19,000                | —      | \$5,763,500           |
| W71                       | —              | 4,081,600                        | 2,834,300                    | 245,400                   | 162,400                 | —      | 7,323,700             |
| W101 Western Option       | —              | 2,806,100–2,806,200 <sup>b</sup> | 986,200–986,500 <sup>b</sup> | 1,527,300                 | 48,100                  | —      | 5,367,700–5,368,100   |
| W101 Central Option       | —              | 1,763,300–1,928,100              | 1,198,800–1,199,200          | 1,603,800                 | 26,800                  | —      | 4,757,500–4,593,100   |
| W101 Eastern Option       | —              | 1,452,600–1,615,900              | 1,499,900–1,500,200          | 1,634,200                 | 18,800                  | —      | 4,768,800–4,605,800   |
| Eastern Section           |                |                                  |                              |                           |                         |        |                       |
| E1                        | —              | \$823,800                        | \$121,500                    | \$719,700                 | \$23,500                | —      | \$1,688,500           |
| Tolleson                  |                |                                  |                              |                           |                         |        |                       |
| Western Section           |                |                                  |                              |                           |                         |        |                       |
| W59                       | —              | —                                | —                            | —                         | —                       | —      | —                     |
| W71                       | —              | —                                | —                            | —                         | —                       | —      | —                     |
| W101 Western Option       | —              | \$784,800–883,400                | \$996,600–1,097,900          | \$100,800                 | —                       | —      | \$1,882,200–2,082,100 |
| W101 Central Option       | —              | 784,800–883,400                  | 1,538,300–1,639,500          | 100,500                   | —                       | —      | 2,423,600–2,623,400   |
| W101 Eastern Option       | —              | 784,800–883,400                  | 1,538,300–1,639,500          | 100,500                   | —                       | —      | 2,423,600–2,623,400   |
| Eastern Section           |                |                                  |                              |                           |                         |        |                       |
| E1                        | —              | —                                | —                            | —                         | —                       | —      | —                     |
| Avondale                  |                |                                  |                              |                           |                         |        |                       |
| Western Section           |                |                                  |                              |                           |                         |        |                       |
| W59                       | —              | —                                | —                            | —                         | —                       | —      | —                     |
| W71                       | —              | —                                | —                            | —                         | —                       | —      | —                     |
| W101 Western Option       | —              | \$0–163,800                      | —                            | —                         | —                       | —      | \$0–163,800           |
| W101 Central Option       | —              | 0–163,800                        | —                            | —                         | —                       | —      | 0–163,800             |
| W101 Eastern Option       | —              | 0–163,800                        | —                            | —                         | —                       | —      | 0–163,800             |
| Eastern Section           |                |                                  |                              |                           |                         |        |                       |
| E1                        | —              | —                                | —                            | —                         | —                       | —      | —                     |

<sup>a</sup> not applicable

<sup>b</sup> W101 Alternative and Options include ranges because of design options; totals do not equal a simple summing of the impacts because the Partial and Full Reconstruction Options would affect land uses differently.

generation coefficients shown in Table 4-17. The impacts would be several times the magnitude of those under existing land uses.

For the City of Phoenix, the W71 Alternative would create the greatest adverse impact, although there do not appear to be large differences among any of the Western Section action alternatives. In the Eastern Section, the E1 Alternative’s projected reduction in property tax revenues for the City of Phoenix would, in the context of all tax revenues that the City of Phoenix would likely collect annually, be nearly inconsequential. For the Cities of Tolleson and Avondale, future property tax revenue impacts would be driven by commercial and industrial land uses.

**Sales Tax Revenues, Future Land Uses**

Similar to property taxes, impacts on local retail sales tax revenues under future land uses would be many times the magnitude of those under existing land uses (Table 4-24). For Phoenix, future sales tax impacts would range from approximately 5 to about 33 times those reported under current conditions. (The higher multiplier is related more to small initial conditions than to an extreme impact.) Of all the action alternatives, the W59 Alternative would cause the greatest loss—by a large margin—in annual sales tax revenues. These reduced revenues would be attributable to the loss of annual tax collections from land that would be lost to R/W acquisition for this alternative. The City of Phoenix’s reductions in sales tax revenues under the E1 Alternative, based on future land uses, are estimated to be about \$3.3 million.

For Tolleson, the increase in lost annual sales tax revenues would be striking for the W101 Alternative and Options. Impacts would change from approximately \$2 million per year to a range of \$5 million to \$6 million. Implementation of any of these options would preclude considerable commercial development and collection of corresponding retail sales tax revenues. Similarly, for Avondale, estimated annual sales tax impacts would jump from approximately \$322,100 under existing land uses to approximately \$806,500 under future conditions. In terms of relative impact on municipal government revenues, the percentage share of

**Table 4-24** Reductions in Annual Sales Tax Revenues Resulting from Right-of-way Acquisition, Future Land Uses, Action Alternatives

| Action Alternative/Option | Land Use       |                                    |                       |                           |                         |        | Total                 |
|---------------------------|----------------|------------------------------------|-----------------------|---------------------------|-------------------------|--------|-----------------------|
|                           | Agricultural   | Commercial                         | Industrial            | Single-family Residential | Multifamily Residential | Vacant |                       |
| Phoenix                   |                |                                    |                       |                           |                         |        |                       |
| Western Section           |                |                                    |                       |                           |                         |        |                       |
| W59                       | — <sup>a</sup> | \$4,941,900                        | \$2,717,000           | —                         | —                       | —      | \$7,658,900           |
| W71                       | —              | 16,077,800                         | 2,385,800             | —                         | —                       | —      | 18,463,600            |
| W101 Western Option       | —              | 11,053,900–11,407,900 <sup>b</sup> | 830,100–830,400       | —                         | —                       | —      | 11,884,300–12,238,000 |
| W101 Central Option       | —              | 6,946,000–7,595,000                | 1,009,100–1,009,400   | —                         | —                       | —      | 7,955,400–8,604,100   |
| W101 Eastern Option       | —              | 5,722,100–6,365,100                | 1,262,500–1,262,800   | —                         | —                       | —      | 6,984,900–7,627,600   |
| Eastern Section           |                |                                    |                       |                           |                         |        |                       |
| E1                        | —              | \$3,244,900                        | \$102,300             | —                         | —                       | —      | \$3,347,200           |
| Tolleson                  |                |                                    |                       |                           |                         |        |                       |
| Western Section           |                |                                    |                       |                           |                         |        |                       |
| W59                       | —              | —                                  | —                     | —                         | —                       | —      | —                     |
| W71                       | —              | —                                  | —                     | —                         | —                       | —      | —                     |
| W101 Western Option       | —              | \$3,864,200–4,349,500              | \$1,048,600–1,155,200 | —                         | —                       | —      | \$4,912,800–5,504,700 |
| W101 Central Option       | —              | 3,860,500–4,349,500                | 1,618,600–1,725,100   | —                         | —                       | —      | 5,479,100–6,074,600   |
| W101 Eastern Option       | —              | 3,860,500–4,349,500                | 1,618,600–1,725,100   | —                         | —                       | —      | 5,479,100–6,074,600   |
| Eastern Section           |                |                                    |                       |                           |                         |        |                       |
| E1                        | —              | —                                  | —                     | —                         | —                       | —      | —                     |
| Avondale                  |                |                                    |                       |                           |                         |        |                       |
| Western Section           |                |                                    |                       |                           |                         |        |                       |
| W59                       | —              | —                                  | —                     | —                         | —                       | —      | —                     |
| W71                       | —              | —                                  | —                     | —                         | —                       | —      | —                     |
| W101 Western Option       | —              | \$806,500                          | —                     | —                         | —                       | —      | \$806,500             |
| W101 Central Option       | —              | 806,500                            | —                     | —                         | —                       | —      | 806,500               |
| W101 Eastern Option       | —              | 806,500                            | —                     | —                         | —                       | —      | 806,500               |
| Eastern Section           |                |                                    |                       |                           |                         |        |                       |
| E1                        | —              | —                                  | —                     | —                         | —                       | —      | —                     |

<sup>a</sup> not applicable  
<sup>b</sup> W101 Alternative and Options include ranges because of design options; totals do not equal a simple summing of the impacts because the Partial and Full Reconstruction Options would affect land uses differently.



the sales tax impact on the smaller jurisdictions would be greater than would be the impacts on the City of Phoenix.

Other Types of Fiscal Impacts

Other types of fiscal impacts were considered in this analysis, but were not estimated because they represent a relatively small portion of total revenues to the communities. Not considered, for example, were capital expenditure reductions and other efficiencies for emergency response teams, reduced maintenance expenses for street repair because of reduced traffic congestion, or the costs of financing and providing additional infrastructure and social services to support community needs on an accelerated time scale.

Combined Property and Sales Tax Impacts, Existing and Future Conditions

Table 4-25 summarizes the combined property tax and retail sales tax impacts on the communities for existing and future land uses. The following text discusses the data presented, by municipality.

Phoenix

For the City of Phoenix, under existing land uses, the W71 Alternative would create substantially greater impact compared with the W59 Alternative and W101 Alternative and Options. This is as expected for the W101 Alternative and Options because they cover less developed land. Under future land uses, the combined impacts would increase substantially and the W59 Alternative would cause the highest adverse impact. Overall, the W101 Alternative Central and Eastern Options and the W71 Alternative would create substantially less impact on the City of Phoenix under future conditions. The E1 Alternative would result in a relatively small reduction in overall tax revenues that would be nearly inconsequential when considered in the context of total tax revenues the City of Phoenix now collects and anticipates collecting in the future.

Tolleson

For the City of Tolleson, under existing and future conditions, the W101 Alternative and Options would

Table 4-25 Estimates of Total Tax Revenue Impacts, Property and Sales Tax Combined, Dollars per Year, Action Alternatives

| Action Alternative/Option | Phoenix                          |                       | Tolleson              |                       | Avondale           |             |
|---------------------------|----------------------------------|-----------------------|-----------------------|-----------------------|--------------------|-------------|
|                           | Land Use Condition               |                       | Land Use Condition    |                       | Land Use Condition |             |
|                           | Existing                         | Future                | Existing              | Future                | Existing           | Future      |
| Western Section           |                                  |                       |                       |                       |                    |             |
| W59                       | \$3,927,900                      | \$13,422,400          | — <sup>a</sup>        | —                     | —                  | —           |
| W71                       | 4,945,800                        | 25,787,300            | —                     | —                     | —                  | —           |
| W101 Western Option       | 2,708,400–2,918,100 <sup>b</sup> | 17,252,400–17,695,700 | \$3,407,300–3,632,500 | \$6,975,100–7,586,800 | \$0–387,500        | \$0–970,300 |
| W101 Central Option       | 1,428,100–1,637,900              | 12,548,500–13,361,700 | 3,888,900–4,114,800   | 7,901,900–8,698,100   | 0–387,500          | 0–970,300   |
| W101 Eastern Option       | 1,476,700–1,686,400              | 11,590,800–12,396,400 | 3,888,900–4,114,800   | 7,901,900–8,698,100   | 0–387,500          | 0–970,300   |
| Eastern Section           |                                  |                       |                       |                       |                    |             |
| E1                        | \$648,900                        | \$5,035,700           | —                     | —                     | —                  | —           |

<sup>a</sup> not applicable  
<sup>b</sup> W101 Alternative and Options include ranges because of design options.

have the greatest impacts because considerably more of this community’s land would be needed for R/W (the community would not be affected under the W59 and W71 Alternatives). Impacts on the City of Tolleson under future land uses would be adverse because of the removal of developable land from the tax base. The City’s total tax revenues would be reduced by 20 to 24 percent under the W101 Alternative and Options, potentially affecting the City’s ability to provide public services. These funds provide for important social and community services in Tolleson such as public safety, highways and streets, economic development, culture and recreation, and health and welfare. The impact of property tax reductions on minority populations in Tolleson is referenced in the *Environmental Justice and Title VI* section.

Avondale

The City of Avondale would be affected by only the W101 Alternative and Options. Existing impacts are estimated to be small in relation to total City revenues, although under future land uses the impacts would likely become relatively greater. Again, this would be because of removal of developable land from the tax base.

No-Action Alternative

The No-Action Alternative would conflict with local jurisdictions’ land use plans that have incorporated a freeway. Not building a freeway in the Study Area would mean that land set aside for the freeway would become available for taxable uses, if the jurisdictions were to change their zoning plans. The communities would have to amend their existing land use plans to identify new uses for land that has been owned by ADOT or that has otherwise been protected for a future freeway use. It is difficult to make projections of fiscal impacts on these communities that would result from expanding their tax base without knowing the specific zoning changes that would occur and the rate of conversion of the land to new and possibly taxable uses.

Impacts on the Traveling Public

A major objective of the proposed action is to improve travel conditions in and around the Phoenix metropolitan area (see Chapter 1, *Purpose and Need*, for detailed discussion regarding the purpose of the proposed action). Alternatively stated, the proposed freeway would reduce automobile and truck travel times throughout the region. The projected time savings, as described in the analysis in this section, would be valuable to the traveling public

Table 4-26 Estimated Value of Motorists’ Travel Time

| Type of Travel  | Person-hours in Traffic <sup>a</sup> (%) | Travel Share <sup>b</sup> (%) |          | Total Hours           |                       | Percentage Value of Travel Time |          | Local Earnings/ Hour Rate |                       | Value of Travel Time |          | Weighted Average Local Travel Time Value |
|---|--|-------------------------------|----------|-----------------------|-----------------------|---------------------------------|----------|---------------------------|-----------------------|----------------------|----------|--|
|   |  | Personal                      | Business | Personal <sup>c</sup> | Business <sup>d</sup> | Personal <sup>e</sup>           | Business | Personal <sup>f</sup>     | Business <sup>g</sup> | Personal             | Business |  |
| Local travel  | 35                                       | 94                            | 6        | 0.33                  | 0.02                  | 50                              | 100      | \$27.57                   | \$27.78               | \$13.79              | \$27.78  | \$14.57 <sup>h</sup>                     |
| Intercity travel  | 55                                       | 87                            | 13       | 0.48                  | 0.07                  | 70                              | 100      | Hour rate                 | 27.78                 | 19.30                | 27.78    | 20.41                                    |
| Truck travel <sup>i</sup>   | 10                                       | —                             | 100      | —                     | 0.10                  | —                               | 100      | —                         | 24.59 <sup>j</sup>    | —                    | 24.59    | 24.59                                    |
| Total weighted average time value (\$ per person-hour) <sup>k</sup> |  |                               |          |                       |                       |                                 |          |                           |                       |                      |          | \$18.78                                  |

<sup>a</sup> The percentage of person-hours in congested traffic for travel on the proposed action is assumed to be 35% for local travel, 55% for intercity travel, and 10% for trucks.

<sup>b</sup> Travel distribution shares, from the U.S. Department of Transportation, derive from on-line analysis of person miles of travel data from the 1995 Nationwide Personal Transportation Survey.

<sup>c</sup> Derived from 94.4% of the time in local traffic being devoted to personal travel: thus, 33% of the total travel hours are devoted to personal local travel (94.4% x 35%).

<sup>d</sup> Derived from 5.6% of the time in local traffic being devoted to business travel: thus, 2% of the total travel hours are devoted to business local travel (5.6% x 35%).

<sup>e</sup> The value of local personal travel is considered to be 50% of that of business travel; for intercity travel, the value is considered to be 70% of that of business travel.

<sup>f</sup> Personal local and intercity earnings/hour rates: The 2012 median household income for Maricopa County (\$54,385) was obtained from the U.S. Census Bureau American Community Survey.

<sup>g</sup> The business local and intercity earnings/hour rates were retrieved from the U.S. Bureau of Labor Statistics Employer Cost for Employee Compensation for U.S. Mountain Region workers in private industry. The most recent per hour data were used (second quarter 2013).

<sup>h</sup> If one assumes a nominal 1,000 hours, 330 hours would be devoted to local personal travel at a valuation of \$13.79 and 20 hours would be devoted to local business travel at a valuation of \$27.78. Adding these together yields a weighted average of \$14.57 (\$4,550.70 and \$555.60 ÷ 350 hours [i.e., 35% of the nominal 1,000 hours] = \$14.59).

<sup>i</sup> The percentage of person-hours in traffic for trucks on the roadway is from MAG 2007 traffic counts on freeways in the Study Area.

<sup>j</sup> Earnings per hour rates for truck drivers were retrieved from the U.S. Bureau of Labor Statistics Employer Cost for Employee Compensation for the U.S. Transportation and Material Moving sector. The most recent per hour data were used (second quarter 2013).

<sup>k</sup> Using a nominal 1,000 hours: 350 hours @ \$14.57 plus 550 hours @ \$20.41 plus 100 hours @ \$24.59 = \$18,784. Dividing this by 1,000 hours gives a weighted average of \$18.78.

and are estimated to be worth approximately \$18.78 per hour (see Table 4-26). This dollar-per-hour figure was multiplied by an estimate of the overall annual travel time reductions per action alternative and option in the region, as measured in the MAG travel demand model, for 2020–2035. The present value<sup>5</sup> of the future time savings that would accrue to the traveling public is an estimate of the monetized benefits resulting from implementation of the proposed project.

Differences in travel time impacts are primarily between the No-Action Alternative and the action alternatives because, from a traffic modeling standpoint, all action alternatives are designed to accomplish the same objectives in the region: reduce congestion and reduce travel time. In 2035, travel time savings for the action alternatives would be approximately 13 million hours annually (see Table 4-27).

There would be some adverse impact on the traveling public during the construction phase of the proposed action alternative because modifications would be

made to I-10 (Papago Freeway) at the freeway’s western terminus and because surface arterial streets would be crossed. These impacts would, however, be temporary and, because the roadway would be constructed in a relatively undeveloped area, these impacts are not anticipated to be severe compared with impacts in a developed corridor. Therefore, travel time impacts during construction are not accounted for in this analysis.

The following discussion develops the dollar per hour figure in more detail and presents the calculations for determining the economic impacts.

Estimating the Value of Motorists’ Time

The value of time spent in traffic congestion can amount to millions of dollars annually. Real monetary costs can be associated with additional productivity costs, worker availability, freight inventory, logistics, just-in-time production, and market access (Weisbrod et al. 2001).

Factors to be considered when estimating the value of motorists’ time include:

- average household income levels
- amount of local and intercity truck travel
- distribution of personal and business travel

Consistent with USDOT guidelines, the analysis determined the value of time for regional personal, business, and truck travel (USDOT 1997). These values were then weighted by the relative volume of each on the road, as estimated at a national level by USDOT (1997). Results are in Table 4-26.

Overall Value of Motorists’ Time Weighted by Type of Travel

Table 4-26 summarizes the calculations used to estimate the overall value of motorists’ travel time in the Phoenix region. A weighted average local travel time value and a weighted average intercity travel time value were calculated using the percentages of personal and business travel to weight the value of earnings per hour for local travel and for intercity travel, respectively. The weighted average local travel time value is \$14.57 per person-hour. The weighted average intercity travel time value is \$20.41 per person-hour. Truck drivers use 100 percent of earnings-per-hour rates for travel because all truck travel is considered for business purposes. The value of time for trucks spent in congestion is \$24.59 per person-hour. An overall weighted value of travel time was then computed based on the relative share of person-hours spent in congestion for local travel, intercity travel, and truck travel; these are assumed to be 35 percent, 55 percent, and 10 percent, respectively. For Maricopa County, the total weighted average time value of congestion is \$18.78 per person-hour. This value was used to estimate the total value of time savings achievable through relieved congestion for each action alternative and option.

Net Travel Delay Reductions Attributable to the Proposed Action

Table 4-27 shows the reduction in delay compared with the No-Action Alternative for each of the action



Table 4-27 Economic Benefit of Reduced Regional Traffic Congestion, Action Alternatives

| Year  | Reduction in Delay Compared with No-Action Alternative (hours/year) |            |            | Economic Benefit Associated with Reduction in Traffic Congestion (\$ million/year) |         |         |
|-------|---|------------|------------|--|---------|---------|
|       | W59/E1  | W71/E1     | W101/E1    | W59/E1   | W71/E1  | W101/E1 |
| 2020  | 9,215,505   | 7,992,675  | 8,632,575  | \$173  | \$150   | \$162   |
| 2021  | 9,480,996   | 8,258,166  | 8,898,066  | 178  | 155     | 167     |
| 2022  | 9,746,487   | 8,523,657  | 9,163,557  | 183  | 160     | 172     |
| 2023  | 10,011,978  | 8,789,148  | 9,429,048  | 188  | 165     | 177     |
| 2024  | 10,277,469  | 9,054,639  | 9,694,539  | 193  | 170     | 182     |
| 2025  | 10,542,960  | 9,320,130  | 9,960,030  | 198  | 175     | 187     |
| 2026  | 10,808,451  | 9,585,621  | 10,225,521 | 203  | 180     | 192     |
| 2027  | 11,073,942  | 9,829,701  | 10,480,023 | 208  | 185     | 197     |
| 2028  | 11,339,433  | 10,073,781 | 10,734,525 | 213  | 189     | 202     |
| 2029  | 11,604,924  | 10,317,861 | 10,989,027 | 218  | 194     | 206     |
| 2030  | 11,870,415  | 10,561,941 | 11,243,529 | 223  | 198     | 211     |
| 2031  | 12,135,906  | 10,806,021 | 11,498,031 | 228  | 203     | 216     |
| 2032  | 12,401,397  | 11,050,101 | 11,752,533 | 233  | 208     | 221     |
| 2033  | 12,666,888  | 11,294,181 | 12,007,035 | 238  | 212     | 225     |
| 2034  | 12,932,379  | 11,538,261 | 12,261,537 | 243  | 217     | 230     |
| 2035  | 13,197,870  | 11,760,930 | 12,505,050 | 248  | 221     | 235     |
| Total |   |            |            | \$3,368  | \$2,982 | \$3,182 |

Source: Maricopa Association of Governments, 2013c; extrapolated analysis  
Note: The value of motorists’ time caught in congestion is \$18.78 per hour (Table 4-26), the number of days per year with congested traffic conditions is 270, and all monetary figures are in 2013 dollars.

alternatives and options from 2020 to 2035. It is assumed that benefits would begin upon project completion, in approximately 2020. Any benefits achieved from partial opening of the proposed freeway were not counted. It was assumed that there are 270 days of congestion per year. In 2035, travel time savings for the action alternatives are expected to be approximately 12 million to 13 million hours annually.

Findings Regarding Travel Time Costs and Effects on Traveling Public

Using the weighted average travel time value of congestion (\$18.78 per person-hour) the total value

of travel time savings was calculated for each action alternative, as shown in Table 4-27. By using the present value of the economic benefits that would accrue from reducing congestion and delays once an action alternative were to become operational, the benefits of constructing an action alternative as compared with the No-Action Alternative were estimated. The present value of travel time savings for each action alternative between 2020 and 2035 would be between \$3 billion and \$3.4 billion. These benefits compare favorably with the estimated total project cost of \$2 billion (for the Preferred Alternative). (All valuations in this paragraph are in 2013 dollars.)

MITIGATION

The mitigation discussion in the section, *Displacements and Relocations*, beginning on page 4-46, presents compensation policies and procedures for displaced residences and businesses.

ADOT District Responsibilities

During construction, the ADOT District office would coordinate with local businesses to ensure reasonable access to businesses would be maintained during regular operating hours.

CONCLUSIONS

Implementation of any of the action alternatives would result in conversion of a taxable land base to a nontaxable land base. The Cities of Phoenix, Tolleson, and Avondale would experience reductions in sales tax and property tax revenues. Reductions experienced by the Cities of Phoenix and Avondale would be inconsequential.

The City of Tolleson would experience a 20 to 24 percent reduction under the W101 Alternative. This, in turn, would have a potentially adverse effect on the City’s ability to effectively provide public services. Implementation of the W101 Alternative would also transfer a higher percentage of developable land in Tolleson to a transportation use than would be the comparable cases in Phoenix and Avondale. The impact of residential relocations on environmental justice and Title VI populations is discussed in the *Environmental Justice and Title VI* section.

The action alternatives would substantially benefit the region through travel time savings and enhanced movement of goods and delivery of services. Depending on which action alternative might be implemented—if any—travel time savings estimated through 2035 would range from \$3 billion to \$3.4 billion (in 2013 dollars); furthermore, approximately 12 million to 13 million hours of travel time would be saved annually. Conversely, under the No-Action Alternative, substantial travel time savings in hours and dollars would not be realized.

AIR QUALITY

The creation of the Clean Air Act (CAA) in 1963 implemented a national effort to maintain healthy air quality by controlling air pollution. The CAA provides the principal framework for national, State, and local efforts to protect air quality. The 1970, 1977, and 1990 CAA amendments renewed and intensified national efforts to reduce air pollution in the United States.

Air pollution comes from many different sources:

- stationary sources
  - factories
  - power plants
  - dry cleaners
- mobile sources
  - motor vehicles
  - construction equipment
  - planes
  - trains
- natural sources
  - windblown dust
  - wildfires

The wide variety of pollutants from these sources can affect local and regional air quality. For additional information regarding the provisions of the CAA, refer to the EPA Web site, <epa.gov/air/caa/peg/index.html>. This section addresses the effects of the proposed action and alternatives, including the No-Action Alternative, on air quality pursuant to the provisions set forth in the CAA, as amended, and related guidance.

REGULATORY OVERVIEW

The environmental awakening of the United States in the middle of the last century launched a series of air pollution control laws, starting with the Air Pollution Control Act of 1955, which identified air pollution as a national problem and recognized the need for research and further action. Eight years later, the 1963 CAA focused on regulating air pollution from stationary sources such as power plants or steel mills. The CAA of 1965 and the Air Quality Act of 1967 set standards for automobile emissions and began to move authority for enforcement of air pollution regulations to the local level. To protect

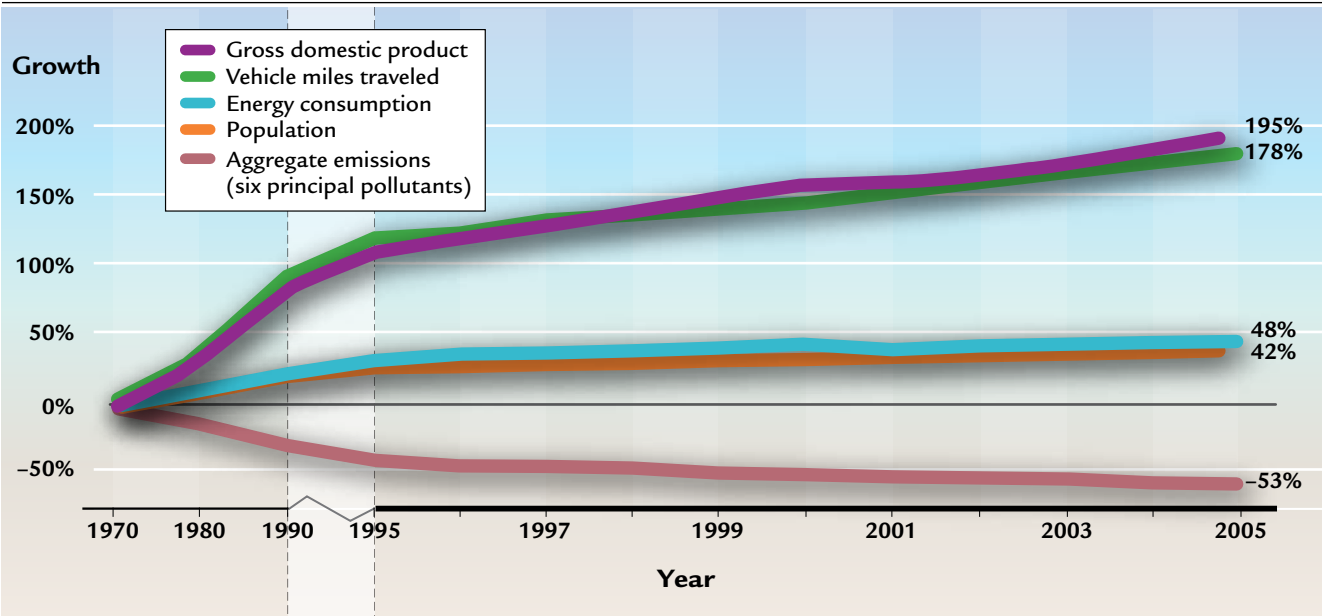
public health, and based on scientific research and analysis of potential health impacts, the 1970 CAA established acceptable concentrations for six criteria air pollutants:<sup>6</sup>

- carbon monoxide (CO)
- nitrogen dioxide (NO<sub>2</sub>)
- ozone (O<sub>3</sub>)
- particulate matter (PM)
- sulfur dioxide (SO<sub>2</sub>)
- lead

Protecting public health continues to be the driving force for modifications and additions to air pollution regulations today. Between 1970 and 2005, emissions of criteria pollutants were cut by more than half, from 273 million metric tons of annual emissions to 133 million metric tons (Figure 4-18). During this period, emissions of CO decreased 54 percent, nitrogen oxides 24 percent, volatile organic compounds (VOCs) (contributors to O<sub>3</sub> formation) 54 percent, SO<sub>2</sub> (a byproduct of diesel combustion) 49 percent, and lead 98 percent (Holmstead 2005). These reductions in air pollution occurred during a period of robust economic growth. Between 1970 and 2005, the U.S. economy grew by more than 195 percent, vehicle miles traveled (VMT) increased by 178 percent, and energy consumption grew by 48 percent.

In 1997, the Arizona Legislature passed House Bill 2307, which required reformulated fuels in Area A (portions of Maricopa, Yavapai, and Pinal counties) from May 1 through September 30 each year, beginning in 1999. In addition, in 1999, the Arizona Legislature passed House Bill 2347, which requires winter fuel reformulation with 3.5 percent oxygen content in Area A from November 1 through March 31 each year, beginning in 2000 (Arizona Administrative Code [A.A.C.] Title 20, Chapter 2, Article 7). EPA’s approval notice of the Arizona Clean Burning Gasoline Program was published in the *Federal Register* on March 4, 2004 (MAG 2009e).

Figure 4-18 Comparison of National Economic and Demographic Growth Indicators and Air Emissions, 1970–2005



Source: U.S. Environmental Protection Agency, 2006

As major indicators of economic or demographic growth increased over the past 35 years, emissions of six principal air pollutants have been halved.



CRITERIA POLLUTANTS

While EPA regulates many air pollutants, certain pollutants are known as “criteria” air pollutants because EPA uses health-related and environmental-based criteria for permissible concentration levels. The permissible levels are known as the National Ambient Air Quality Standards (NAAQS). One set of limits (primary standards) protects health; another set (secondary standards) is intended to minimize environmental and property damage (Table 4-28). These pollutants are monitored by State and local agencies. In Maricopa County, the Maricopa County Air Quality Department (MCAQD) and the Arizona Department of Environmental Quality (ADEQ) maintain a network of air quality monitoring sites, most of which are located in Phoenix and surrounding communities. Observations as well as atmospheric measurements (see text box on this page) are collected for research and analysis. A geographic area in which concentrations of criteria pollutants are less than the primary standard is called an attainment area. A geographic area where the concentration of a criteria pollutant exceeds the primary standard is called a nonattainment area.<sup>7</sup>

In the Phoenix area, three of the six criteria pollutants have been historically measured at concentrations higher than the NAAQS (i.e., nonattainment). Local actions were required to reduce concentrations of CO, O<sub>3</sub>, and PM<sub>10</sub>. The Study Area currently lies in a nonattainment area for the 2008 8-hour O<sub>3</sub> standard. The Maricopa County area was redesignated to attainment for CO in 2005, and EPA found the Study Area in attainment for the 24-hour PM<sub>10</sub> standard on July 10, 2014.

Characteristics of Criteria Pollutants

Lead

Lead is a heavy metal that, at certain exposure levels, can harm the kidneys, liver, nervous system, and other organs. It may cause neurological impairments, such as seizures, mental retardation, and behavioral and learning disorders. Recent studies also show that lead may be a factor in high blood pressure and subsequent heart disease. Motor vehicles were the main source of lead air pollution in the past. Lead was an “antiknock” additive used in gasoline.

EPA set regulations during the 1980s to gradually reduce the amount of lead added to gasoline. A 1996 CAA amendment banned the sale and use of leaded gasoline in the United States. Since then, lead emissions from vehicles have decreased by about 98 percent nationally.<sup>8</sup> The Phoenix area is in attainment for lead.

Nitrogen Dioxide

NO<sub>2</sub> is a reddish-brown gas belonging to the highly reactive family of gases called nitrogen oxides. Prolonged exposure to NO<sub>2</sub> irritates the lungs and may decrease resistance to respiratory infections, especially in people with existing respiratory illnesses such as asthma. NO<sub>2</sub> is a precursor compound in the photochemical formation of O<sub>3</sub> and, also, in the formation of PM<sub>2.5</sub>, a component of the “brown cloud” frequently observed during fall and winter (see text box on this page). Sources of NO<sub>2</sub> in the Phoenix area include on-road vehicles (58 percent), off-road vehicles (27 percent), and other sources (15 percent) such as power-generating stations, naturally occurring soil processes, and manufacturing plants. NO<sub>2</sub> emissions have declined because of the use of reformulated fuels.

Ambient concentrations of NO<sub>2</sub> are well below the annual standard in the Phoenix metropolitan area. During 2009, MCAQD operated five NO<sub>2</sub> monitoring sites, and none recorded an exceedance of either the 1-hour or the annual standard. On February 9, 2010, EPA finalized a new primary 1-hour NO<sub>2</sub> NAAQS of 0.1 part per million (ppm). This level is intended to protect against adverse health effects associated with short-term exposure to NO<sub>2</sub>. New networks of near-road NO<sub>2</sub> monitors for the hourly standard are required to be operational between January 1, 2014, and January 1, 2017. The Phoenix area is in attainment for NO<sub>2</sub>.

Sulfur Dioxide

SO<sub>2</sub> is a colorless gas that has a pungent odor at higher concentrations. Prolonged exposure to SO<sub>2</sub> irritates the lungs and may reduce airflow through nasal passages and airways, especially in people who have asthma and are exposed to high concentrations and in those exposed to high concentrations through outdoor exercise. Like NO<sub>2</sub>, SO<sub>2</sub> is also a precursor compound in the formation

Table 4-28 National Ambient Air Quality Standards

| Pollutant  | Averaging Time  | Primary                | Secondary              |
|--|-----------------|------------------------|------------------------|
| Carbon monoxide                                      | 1-hour          | 35 ppm <sup>a</sup>    | no standard            |
|  | 8-hour          | 9 ppm                  | no standard            |
| Nitrogen dioxide                                     | Annual          | 0.053 ppm              | 0.053 ppm              |
|  | 1-hour          | 0.1 ppm                | no standard            |
| Ozone  | 8-hour          | 0.075 ppm              | 0.075 ppm              |
| Particulate matter (PM <sub>2.5</sub> ) <sup>c</sup> | 24-hour         | 35 µg/m <sup>3b</sup>  | 35 µg/m <sup>3</sup>   |
|  | Annual          | 12 µg/m <sup>3</sup>   | 15 µg/m <sup>3</sup>   |
| Particulate matter (PM <sub>10</sub> ) <sup>d</sup>  | 24-hour         | 150 µg/m <sup>3</sup>  | 150 µg/m <sup>3</sup>  |
| Lead   | rolling 3-month | 0.15 µg/m <sup>3</sup> | 0.15 µg/m <sup>3</sup> |
| Sulfur dioxide (SO <sub>2</sub> )                    | 1-hour          | 75 ppb <sup>e</sup>    | NA <sup>f</sup>        |
|  | 3-hour          | NA                     | 0.5 ppm                |

Source: 40 Code of Federal Regulations Part 50  
<sup>a</sup> parts per million   <sup>b</sup> micrograms per cubic meter   <sup>c</sup> for particles less than or equal to 2.5 microns (2.5 millionths of a meter) in diameter   <sup>d</sup> for particles less than or equal to 10 microns (10 millionths of a meter) in diameter   <sup>e</sup> parts per billion   <sup>f</sup> not applicable

of PM<sub>2.5</sub>, a component of the “brown cloud” that forms frequently during the fall and winter.

Sources of SO<sub>2</sub> in the Phoenix area include point sources, such as industry and mining (32 percent); area sources, such as small industry or household activities (26 percent); off-road vehicles (23 percent); and on-road vehicles (19 percent). Major control technology installed in Arizona’s copper smelters during the 1980s reduced SO<sub>2</sub> emissions substantially. SO<sub>2</sub> emissions are expected to decline in the future with the introduction of reformulated fuels. Ambient concentrations of SO<sub>2</sub> were measured at two sites during 2009. On June 22, 2010, EPA finalized a new primary 1-hour SO<sub>2</sub> standard and revoked the 24-hour and annual standards. The 3-hour standard remains a secondary standard for SO<sub>2</sub>. No exceedances of these standards have been recorded in the region. The Phoenix area is in attainment for SO<sub>2</sub>.

A Word about the Brown Cloud

Phoenix’s brown cloud is a hazy condition caused by the accumulation in the atmosphere of PM<sub>2.5</sub>, SO<sub>2</sub>, and NO<sub>2</sub>, with PM<sub>2.5</sub> being the predominant contributor. In the Phoenix metropolitan area, about 34 percent of PM<sub>2.5</sub> emissions are attributed to on-road mobile sources. Other PM<sub>2.5</sub> sources include construction dust and equipment, agriculture, industry, leaf blowers, diesel generators, and fireplaces. In the region, the brown cloud tends to be worse and more frequent in the winter, when temperature inversions tend to trap pollutants near the ground.

Source emission standards are expected to dramatically reduce the on-road mobile source contribution to brown cloud pollutants. These standards, phased in between 2006 and 2010, have reduced sulfur content, nitrogen oxides, and PM<sub>2.5</sub> in heavy-duty diesel truck engines. New engine and gasoline standards for cars and light trucks are also expected to result in substantial reductions in sulfur and nitrogen oxides over the next two decades.

Carbon Monoxide

CO is a colorless and odorless gas produced by incomplete combustion of hydrocarbon fuels. When CO enters the bloodstream, it reduces the delivery of oxygen to the body’s organs and tissues. Health risks are most serious for those who suffer from cardiovascular disease, particularly those with angina or peripheral vascular disease. Because CO is a gas, it tends to disperse relatively quickly from its source.

Nationwide, 77 percent of CO emissions are from transportation sources, with more than 65 percent of that from on-road sources. In Arizona’s metropolitan areas, about 47 percent of CO emissions come from on-road motor vehicles, 50 percent from off-road vehicles or equipment such as construction vehicles and lawn or garden equipment, and 3 percent from fuel combustion from commercial and residential heating. The highest levels of CO are found in the winter months, when thermal inversions tend to trap pollutants near the ground.

The Maricopa County Carbon Monoxide Maintenance Area was originally classified as a “moderate”

nonattainment area in November 1990, and EPA required attainment by December 1995. The Maricopa County area did not attain the CO standard by this date, and EPA reclassified the area as a “serious” nonattainment area in June 1996. EPA required that MAG prepare a strategy to address the CO problem, and the strategy was included in the State’s air quality plan (State Implementation Plan, or SIP). In September 2003, EPA concluded that the Maricopa County area had attained the CO standard. On March 9, 2005, EPA redesignated the Maricopa County area as attainment for CO and approved a maintenance plan for the area. The maintenance plan requires many of the same control measures as the nonattainment SIP; these measures will remain in place through 2015. MAG submitted a second maintenance plan in April 2013 that demonstrated maintenance of the CO standard through 2025 with existing control measures.

CO concentrations have declined in the Maricopa County area by as much as two-thirds since the mid-to late-1970s. The number of days when the 8-hour CO standard was exceeded declined steadily and

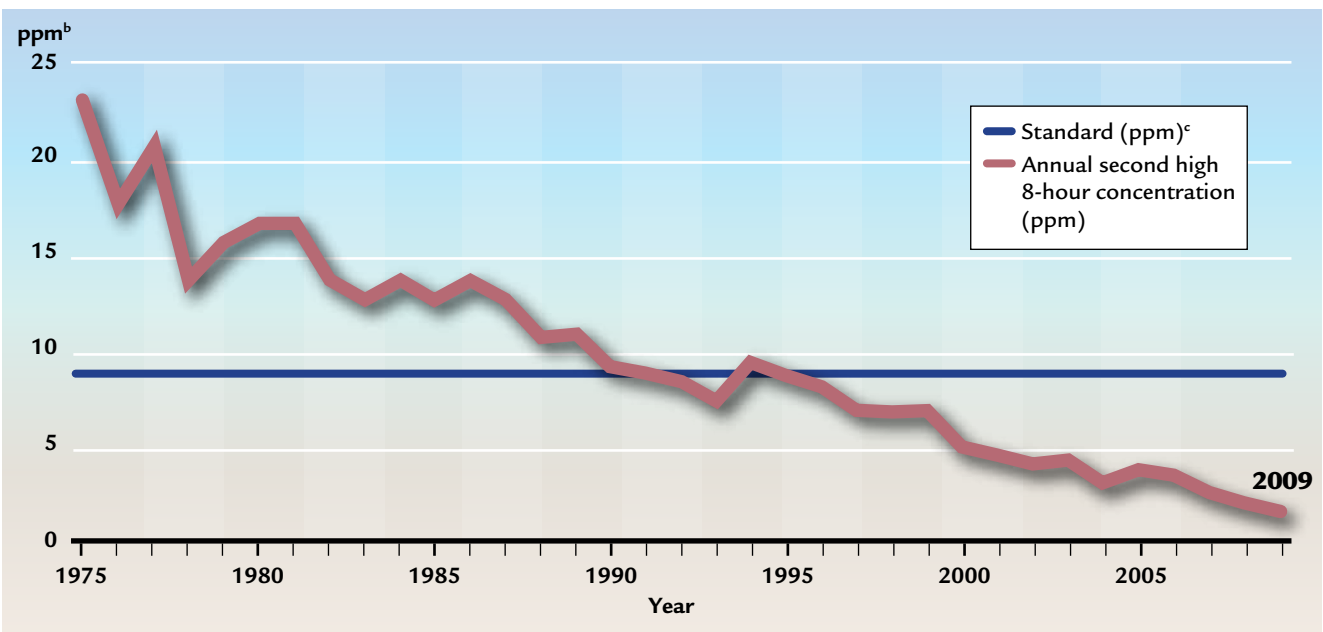
dramatically from 86 days in 1984 to 4 days in 1990. There have been no violations of the 8-hour standard in the area since 1996. Most of this improvement can be attributed to federal standards for new-vehicle emissions, augmented by emission reductions from Arizona’s Vehicle Emissions Inspection Program (begun in 1976) and the use of oxygenated fuels in the winter (initiated in 1989). During 2009, MCAQD operated 13 CO monitoring sites, and none reported an exceedance of either the 1-hour or the 8-hour standard. Figure 4-19 shows the decrease in concentrations for 8-hour CO exposures at the Central Phoenix monitoring site.<sup>9</sup>

Ozone

Although O<sub>3</sub> in the upper atmosphere is critical to life because it shields the earth from high levels of harmful ultraviolet radiation from the sun, high concentrations of O<sub>3</sub> at ground level can affect plant and animal health. In humans, O<sub>3</sub> has the potential to damage lung tissue, reduce lung function, and sensitize the lungs to other irritants. Exposure to high concentrations of O<sub>3</sub> for as little as several hours has been found to reduce lung function and induce respiratory inflammation.<sup>10</sup>

O<sub>3</sub> is not emitted directly as a tailpipe pollutant, but is formed through complex atmospheric photochemical reactions with other pollutants, primarily VOCs and nitrogen oxides. For this reason, O<sub>3</sub> is considered a regional pollutant. Federal requirements dictate that emissions of compounds that contribute to O<sub>3</sub> formation (known as O<sub>3</sub> precursors) cannot exceed certain limits. In general, on-road vehicle emissions account for nearly one third of the VOC emissions and nearly 60 percent of the nitrogen oxides from the greater Phoenix area (ADEQ 2010). Sunlight and high temperatures accelerate the photochemical reactions that form O<sub>3</sub>, so peak O<sub>3</sub> levels in Arizona occur during the summer. MAG conducts regional O<sub>3</sub> studies and analyses. EPA promulgated two health-based regulations: one limited the 1-hour O<sub>3</sub> average concentration and one set an 8-hour average O<sub>3</sub> concentration. The Maricopa Ozone Nonattainment Area, including the Phoenix metropolitan area, was originally designated a nonattainment area in 1991 for not meeting the 1-hour O<sub>3</sub> NAAQS. EPA reclassified the Maricopa area to “serious” nonattainment

Figure 4-19 Annual Second High 8-hour Carbon Monoxide Concentrations, Phoenix,<sup>a</sup> 1980–2009



Source: Maricopa County Air Quality Department, 2010

<sup>a</sup> based on monitoring data from the Central Phoenix monitoring site

<sup>b</sup> concentration in parts per million

<sup>c</sup> National Ambient Air Quality Standard for carbon monoxide, 8-hour concentration

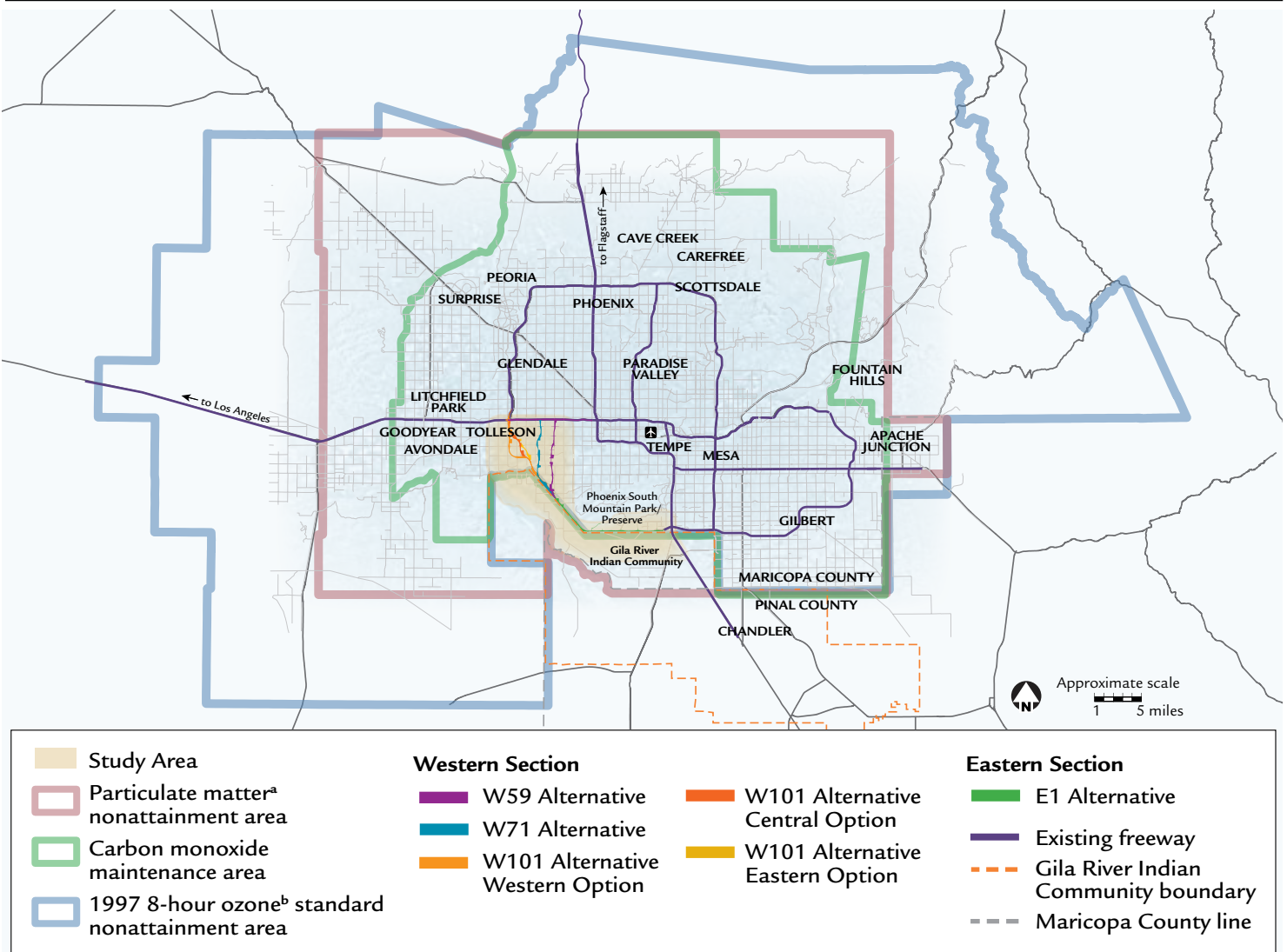
*The 8-hour CO concentrations in Phoenix have declined dramatically and generally steadily since the mid-1970s.*



in 1998 for failing to attain the 1-hour O<sub>3</sub> standard. The State of Arizona requested attainment redesignation in December 2000 as a result of 3 years with no O<sub>3</sub> violations. In May 2001, EPA determined that the Maricopa area had attained the 1-hour O<sub>3</sub> standard. A maintenance plan with a redesignation request was submitted to EPA in April 2004. The 1-hour O<sub>3</sub> maintenance plan and redesignation request were approved by EPA in June 2005, but EPA revoked the 1-hour standard in June 2005 in Arizona.

The 8-hour O<sub>3</sub> standard, as adopted by EPA in 1997 and revised in 2008, is expressed as the 3-year average of the annual fourth-highest concentration. In 2004, the Maricopa area was designated a Basic nonattainment area for the 1997 8-hour O<sub>3</sub> standard. The Maricopa 8-hour Ozone Nonattainment Area covers a large area of eastern Maricopa County, including the Phoenix metropolitan area and Apache Junction in Pinal County, as shown on Figure 4-20.

**Figure 4-20** Nonattainment and Maintenance Areas for Particulate Matter,<sup>a</sup> Carbon Monoxide, and Ozone,<sup>b</sup> Maricopa County



Source: Arizona Department of Transportation, 2013, *Air Quality Assessment South Mountain Freeway 202L Draft Report*

<sup>a</sup> particulate matter greater than or equal to 10 microns (10 millionths of a meter) in diameter

<sup>b</sup> In 2012, the U.S. Environmental Protection Agency finalized the boundary for the 8-hour standard nonattainment area, expanding it slightly to the south and west within Maricopa County to encompass existing power plants.

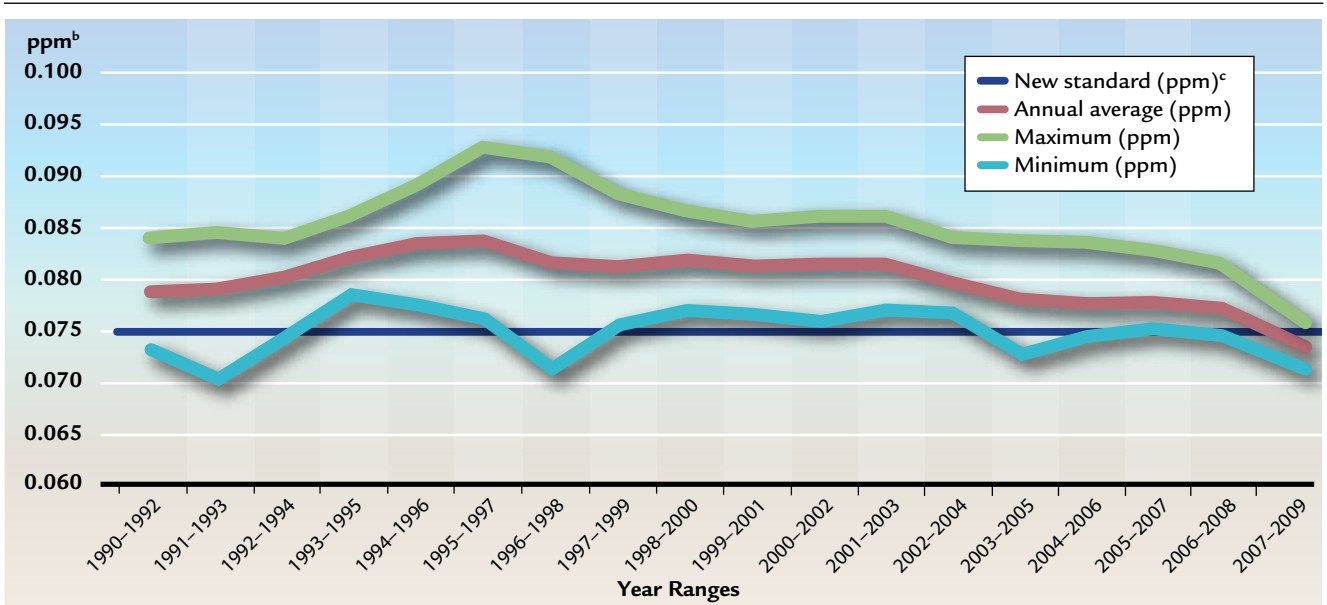
Air quality issues may be regional in nature.

MAG submitted a nonattainment area plan for the 1997 8-hour O<sub>3</sub> standard to EPA in 2007. Based on monitoring data, there have been no violations of the 1997 8-hour O<sub>3</sub> standard at any monitor since 2004. In 2009, MAG submitted a redesignation request and maintenance plan to EPA for the 1997 8-hour standard. On June 13, 2012, EPA approved the MAG nonattainment area plan for the 1997 8-hour ozone standard.

In 2008, EPA reduced the 8-hour O<sub>3</sub> standard from 0.08 ppm to 0.075 ppm. In May 2012, EPA designated the Maricopa area as a Marginal nonattainment area for the 2008 8-hour O<sub>3</sub> standard. The nonattainment area for the 2008 8-hour O<sub>3</sub> standard is slightly larger than the 1997 8-hour O<sub>3</sub> nonattainment area, expanding farther south and west in Maricopa County to encompass existing power plants.

Long-term trends in 8-hour concentrations of O<sub>3</sub> can be detected by examining data from six sites in the Phoenix area that have been in operation since 1990 (Figure 4-21). The six sites are Central Phoenix, Glendale, North

**Figure 4-21** Exceedances of Maximum 8-hour Ozone Concentrations, Phoenix,<sup>a</sup> 1990–2009



Source: Arizona Department of Environmental Quality, 2010

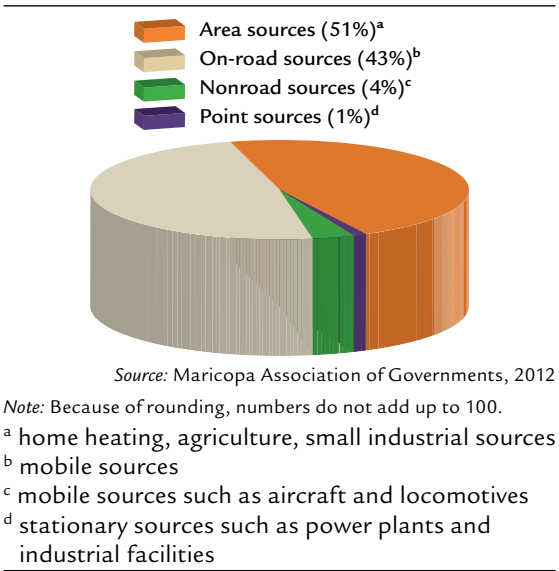
<sup>a</sup> based on monitoring data from six sites: Central, North, and West Phoenix; Glendale; Pinnacle Peak; and South Scottsdale

<sup>b</sup> concentration in parts per million

<sup>c</sup> National Ambient Air Quality Standard for ozone, 8-hour concentration

Although the average values at six monitoring sites have generally declined over time, values at some locations exceed the 8-hour ozone standard of 0.075 ppm based on the 2010 to 2012 monitoring data.

**Figure 4-22** Regional PM<sub>10</sub> Emissions Sources, Phoenix, 2012



*These relative shares of airborne particulate matter (10 microns in diameter or less) from various emissions sources reflect use of in-place, committed control measures.*

Phoenix, Pinnacle Peak, South Scottsdale, and West Phoenix. In addition to the 3-year average of the annual fourth-highest concentration, the minimum and maximum values are also shown to demonstrate any spatial variability that may exist across the Phoenix area. In general, there is a decrease in 8-hour concentrations from 1990 to 2009, with the majority of the decrease occurring from the mid- to late-1990s to 2008 (ADEQ 2010).

**Particulate Matter**

Particulates are small liquid or solid particles suspended in the atmosphere and may cause irritation and damage to the respiratory system. Exposure to particulates may aggravate existing lung disease, such as asthma or bronchitis, and may increase susceptibility to respiratory infections. Initially, the CAA set standards for all airborne PM. This was referred to as Total Suspended Particulates. In 1987, using additional information on potential health effects, however, EPA began using a new indicator, PM<sub>10</sub>, which includes only those particles with a diameter less than or equal to 10 microns (micrometers). Ten microns is approximately one seventh the diameter of a human hair. The PM<sub>10</sub> fraction of Total Suspended Particulates was considered more important in adversely affecting human health. EPA adopted an annual and a 24-hour standard for PM<sub>10</sub>. EPA revoked the annual PM<sub>10</sub> standard, however, in late 2006.

Because of its many sources and broad size range, particulate pollution does not have a specific season when it is most troublesome; its effects, however, are aggravated by dry conditions and high winds. On-road sources account for 43 percent of PM<sub>10</sub> emissions in Maricopa County, as shown in Figure 4-22.

The Maricopa County Particulate Matter Nonattainment Area was originally classified in November 1990 as “moderate.” The area was reclassified in June 1996 to “serious” nonattainment status, requiring attainment by 2001, as shown on Figure 4-20. The State of Arizona submitted a revised plan to achieve attainment and requested a 5-year extension of the attainment deadline for the 24-hour and annual PM<sub>10</sub> standards for the Maricopa County area. In July 2002, EPA announced approval of the plan and granted the extension to December 2006.

However, there were numerous exceedances of the 24-hour PM<sub>10</sub> standard in 2005 and 2006. On June 6, 2007, EPA published a final notice stating that the nonattainment area had failed to attain the standard by December 31, 2006, triggering the CAA requirement to prepare a Five Percent Plan for PM<sub>10</sub>. The MAG 2007 Five Percent Plan for PM<sub>10</sub> was submitted to EPA in December 2007. The plan’s committed measures demonstrated at least a 5 percent reduction in PM<sub>10</sub> emissions per year and attainment of the PM<sub>10</sub> standard in 2010. On September 9, 2010, EPA proposed a partial approval and disapproval of the MAG 2007 Five Percent Plan. The two major reasons for the proposed disapproval were 1) the 2005 baseline emissions inventory was inaccurate since it overestimated construction and other emissions and 2) the EPA nonconcurrence with four high-wind exceptional events at the West 43rd Avenue monitor in 2008 that resulted in a violation of the 24-hour PM<sub>10</sub> standard. On January 25, 2011, ADEQ withdrew the MAG 2007 Five Percent Plan to address technical approvability issues identified by EPA and to include new information. Although the plan was withdrawn, the measures in the plan continue to be implemented. In May 2012, ADEQ submitted a revised MAG 2012 Five Percent Plan for the region. On July 20, 2012, EPA made an official finding that the MAG 2012 Five Percent Plan was administratively complete. This decision ended the sanctions clocks associated with Arizona’s decision to withdraw the MAG 2007 Five Percent Plan. On February 6, 2014, EPA published a notice in the *Federal Register* proposing to approve the MAG 2012 Five Percent Plan for the Maricopa County nonattainment area. In the same notice, EPA stated that it would concur with exceptional event (as a result of haboobs and dust storms) documentation prepared by ADEQ, which would give the region the 3 years of clean data needed for attainment of the PM<sub>10</sub> 24-hour standard. Finally on May 30, 2014, EPA approved the 2012 Five Percent Plan and found the area in attainment of the 24-hour PM<sub>10</sub> standard based on the monitoring data for the years 2010 to 2012.

EPA has modified the health standards for particulates. Data suggest that particles 2.5 microns or smaller in

diameter (PM<sub>2.5</sub>), may pose the greater threat to human health because they more readily attach to toxic and carcinogenic compounds and penetrate more deeply into the lungs. In December 2012, EPA updated the NAAQS for PM<sub>2.5</sub>, setting the primary annual standard at 12 micrograms per cubic meter (µg/m<sup>3</sup>) and keeping the 24-hour PM<sub>2.5</sub> standard at 35 µg/m<sup>3</sup>. Monitoring for PM<sub>2.5</sub> in the Phoenix metropolitan area indicates PM<sub>2.5</sub> is below these health standards. According to the Maricopa County 2008 Periodic Emissions Inventory, approximately 34 percent of the total PM<sub>2.5</sub> emissions are from on-road mobile sources in the Phoenix metropolitan area. Nonroad mobile, area, and point sources are responsible for about 66 percent of total PM<sub>2.5</sub> emissions.

**MOBILE SOURCE AIR TOXICS**

In addition to the criteria pollutants, EPA regulates hazardous air pollutants (HAPs), which are a range of compounds known for or suspected of having serious health or environmental impacts. Under the CAA, EPA regulates 188 HAPs. According to EPA, most HAPs originate from human-made sources, including indoor sources such as fumes from cooking, home supplies, or building materials, and outdoor sources such as refineries, chemical plants, gasoline stations, and vehicle emissions. Some HAPs are also released from natural sources such as forest fires.

In March 2001, EPA issued a final rule on *Control of Emissions of Hazardous Air Pollutants from Mobile Sources*, which developed a list of 21 mobile source air toxics (MSATs) and then refined it further, compiling a subset of seven pollutants identified as having the greatest influence on health: acrolein; benzene; 1,3-butadiene; diesel particulate matter (DPM); formaldehyde; naphthalene; and polycyclic organic matter (POM). EPA has already placed requirements into law that will limit future emissions of these contaminants from motor vehicles. Unlike the criteria pollutants, however, no NAAQS have yet been established for MSATs.



Discussion of Pollutants

The following sections contain general information about sources, exposures, reactivity, and health risks for the seven MSATs. In general, all these pollutants derive from multiple sources in any urban environment. The most prevalent form of exposure is inhalation.

Acrolein

Acrolein is released into the air as a result of manufacturing acrylic acid, which is used in plastics, coatings, floor polishes, and paints. It can be also formed from the breakdown of certain pollutants in outdoor air or from burning tobacco or gasoline.<sup>11</sup> Fuel combustion represents the major source of emissions of acrolein to the atmosphere (EPA 2003). According to the Integrated Risk Information System, acrolein’s potential carcinogenicity cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure. Short-term inhalation exposure may result in upper respiratory tract irritation and congestion. No information is available on its reproductive and developmental effects in humans. Acrolein is highly reactive and remains in the atmosphere for only a short time, making it difficult to detect ambient atmospheric concentrations. Acrolein is rapidly metabolized by organisms and does not bioaccumulate.<sup>12</sup>

Benzene

Benzene is a known human carcinogen and a natural component of petroleum. It is added to gasoline as an antiknock agent at concentrations of between 1 and 2 percent. Benzene may be emitted by evaporation of gasoline or from the incomplete combustion of fuel. Benzene is emitted to the air from many different sources. According to EPA’s *Toxicity and Exposure Assessments for Children’s Health*, benzene concentrations in indoor air are also significant contributors to children’s exposures, particularly in homes where people smoke.<sup>13</sup> Benzene levels in homes are usually higher than outdoor levels, often because of venting of gasoline vapors from attached garages. For example, a study in Michigan found that the average concentration of benzene in residential garages was

36.6 µg/m<sup>3</sup>, compared with 0.4 µg/m<sup>3</sup> outdoors.<sup>14</sup> Other common household sources of benzene are stored gasoline, glues, paints, furniture wax, detergents, and other consumer products. Cigarette smoke also contains high levels of benzene. The Stochastic Human Exposure and Dose Simulation – Air Toxics study also indicated that 15 percent of the average annual exposure to benzene occurred inside vehicles while driving and about 15 percent of the exposure occurred during vehicle refueling. Chemical reactions limit the atmospheric residence time of benzene to only a few days, and possibly to only a few hours (Agency for Toxic Substances and Disease Registry 2005).

1,3-butadiene

Large amounts (about 3 billion pounds) of 1,3-butadiene are produced each year from petroleum gases. Over 60 percent of this is used to make components of automobile tires. Smaller percentages are used in the manufacture of nylon, copolymer latexes, neoprene rubber, resins, rocket propellants, specialty copolymer resins, latexes for paints, coatings, adhesives, and as an additive to oil lubricants. Exposure to 1,3-butadiene mainly occurs in the following industries: rubber and latex production, petroleum refining, secondary lead smelting, water treatment, agricultural fungicides, and production of raw material for nylon.<sup>15</sup> Small amounts of 1,3-butadiene are found in gasoline, automobile exhaust, cigarette smoke, and wood smoke. 1,3-butadiene is a colorless gas with a mild, aromatic, gasoline-like odor. It is noncorrosive but highly flammable. The vapor is heavier than air. Under EPA’s *Guidelines for Carcinogen Risk Assessment* (2005), 1,3-butadiene is characterized as carcinogenic to humans by inhalation. 1,3-butadiene does not bioaccumulate.<sup>16</sup> Estimates for atmospheric residence time in several U.S. cities ranged from 0.4 hour under clear skies at night in the summer to several days under cloudy skies at night in the winter. Residence times during daylight hours are shorter and vary by season. Given the generally short daytime residence times, the net atmospheric lifetime of 1,3-butadiene is short and there is generally limited potential for long-range transport of this compound (Hughes et al. 2001). It should be noted, however, that 1,3-butadiene is transformed into acrolein and formaldehyde in the atmosphere.<sup>17</sup>

Formaldehyde

Formaldehyde is a colorless gas that is both naturally occurring and the result of human activity. It is one component of diesel exhaust and is a secondary pollutant produced by the atmospheric reactions of other pollutants, including 1,3-butadiene, a chemical found in automobile exhaust.<sup>18</sup> In general, indoor environments consistently have higher concentrations of formaldehyde than outdoor environments because many building materials, consumer products, and fabrics emit formaldehyde. Exposure most often occurs through inhalation of fumes, particularly indoors where concentrations can accumulate because of poor ventilation. Workers can be exposed during direct production, treatment of materials, and production of resins. Healthcare professionals, pathology and histology technicians, and teachers and students who handle preserved specimens may be exposed. Exposure to formaldehyde may irritate the eyes, nose, and throat, and can cause skin and lung allergies.<sup>19</sup> In 1987, EPA classified formaldehyde as a probable human carcinogen under conditions of unusually high or prolonged exposure, according to the Integrated Risk Information System, based on limited evidence in humans, but on sufficient evidence in animals. In June 2004, the International Agency for Research on Cancer reclassified formaldehyde as a known human carcinogen. Formaldehyde breaks down quickly in the atmosphere and does not accumulate in the body.<sup>20</sup>

Diesel Particulate Matter

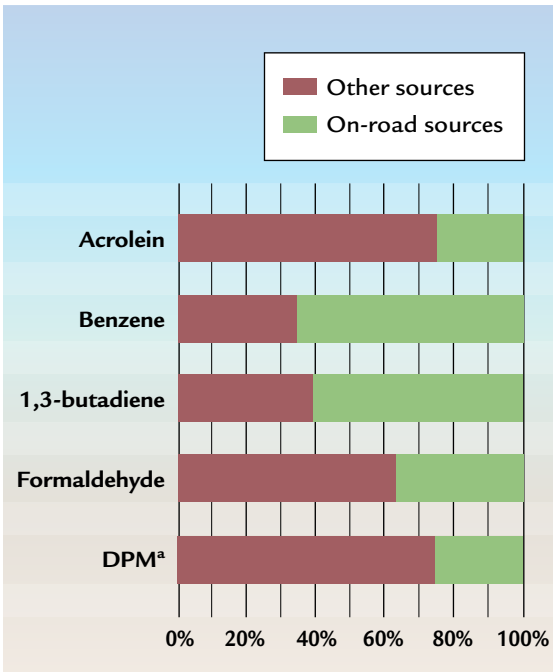
DPM is emitted by diesel automobiles, generators, light-duty and heavy-duty vehicles, railroad locomotives, and many off-road vehicles including construction equipment. In Maricopa County, heavy-duty trucks and buses account for approximately one quarter of DPM emissions from all mobile sources.<sup>21</sup> When diesel fuel burns in an engine, the resulting exhaust includes gases and soot that may contain hundreds of different chemical substances. Contaminants emitted as gases condense to form a wide variety of small particles that compose DPM. These fine particles have a large surface area, which makes them an excellent medium for adsorbing

Table 4-29 Priority Mobile Source Air Toxics Emissions, Maricopa County, 2002

| Pollutant     | On-road Mobile Sources<br>(% of total) | Other Sources<br>(% of total) | Total<br>(tons of emissions) |
|---------------|--|-------------------------------|------------------------------|
| Acrolein      | 44                                     | 56                            | 58                           |
| Benzene       | 54                                     | 46                            | 2,008                        |
| 1,3-butadiene | 58                                     | 42                            | 242                          |
| Formaldehyde  | 55                                     | 45                            | 1,102                        |
| Napthalene    | 21                                     | 79                            | 137                          |

Source: U.S. Environmental Protection Agency, 2009

Figure 4-23 Priority Mobile Source Air Toxics Emissions, Maricopa County



<sup>a</sup> diesel particulate matter  
Source: U.S. Environmental Protection Agency, “National Air Toxics Assessment; Emissions Data Tables”

In Maricopa County in 1999, benzene and 1,3-butadiene are the predominant mobile source air toxics emissions (by weight) from on-road sources.

organic compounds, including those that can cause health risks. Also, if inhaled, these small particles can reach deeper levels of the lungs. DPM disperses rapidly, but is nonreactive, and it can stay in the air for days or weeks. DPM can accumulate in the lungs over time if exposures continue (EPA 2002). People working near diesel engines in agriculture, construction, and railroads are potentially exposed to elevated levels. According to the Integrated Risk Information System, diesel exhaust is likely to be carcinogenic to humans by inhalation from environmental exposures. DPM as reviewed in this document is the combination of DPM and diesel exhaust organic gases. DPM exacerbates existing respiratory effects. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

Naphthalene

Naphthalene is a white crystalline, volatile solid that converts from a solid directly to a gas without an intermediate liquid phase at room temperature so that it exists as a gas in the atmosphere. Naphthalene is produced from petroleum refining and coal tar distillation. It is used in smokeless powder, cutting fluids, lubricants, synthetic resins, tanning product preservatives, and textile chemicals. Naphthalene is released to the air from the burning of coal and oil and from mothballs. Examples of human-made emission sources include paper mills, manufacturers of some wood products, and some combustion processes such as refuse combustion and coal tar pitch fumes.

Naphthalene has also been detected in tobacco smoke and vehicle exhaust. Natural emission sources include crude oil and natural uncontrolled combustion. Acute exposure to naphthalene by inhalation, ingestion, and skin contact is associated with hemolytic anemia, liver damage, and, in infants, neurological damage. Symptoms include headache, nausea, vomiting, diarrhea, malaise, confusion, convulsion, and coma. Naphthalene vapors are highly irritating to the eyes, and cataracts have been reported in humans who experience acute exposure to naphthalene. EPA has classified naphthalene as a possible human carcinogen.

Polycyclic Organic Matter

POM is a broad class of over 100 organic compounds with more than one benzene ring. POM can be divided into two subgroups: polycyclic aromatic hydrocarbons (PAHs) and PAH-derivatives. PAHs are organic compounds that include only carbon and hydrogen; PAH-derivatives contain other elements in addition to carbon and hydrogen. In general, compounds with two rings, such as naphthalene, exist as a gas. Compounds with three to four rings, such as pyrene, exist either as a gas or a particle, depending on the temperature and pressure. Compounds with five rings, such as dibenzo[a,h]anthracen and benzo[a]pyrene, exist as particles in the atmosphere. POM is produced by the incomplete combustion of fossil fuels and vegetable matter and is generally present in the atmosphere in particulate form. Examples of human-made emission sources include cigarette smoke, grilling meat, home heating, fireplaces, vehicle exhaust, coal-fired power plants, petroleum refineries, paper mills, and roofing tar. POM can also be formed from any naturally occurring combustion, such as forest fires. Exposure to POM can occur through inhalation, ingestion, and skin contact. Epidemiological studies have reported an increase in lung cancer in humans exposed to coke oven emissions, roofing tar emissions, and cigarette smoke. Animal studies have reported respiratory tract tumors from inhalation exposure to benzo[a]pyrene and forestomach tumors, leukemia, and lung tumors from oral exposure to benzo[a]pyrene. The exposure of skin to mixtures of carcinogenic PAHs can cause skin disorders; adverse

skin effects have been reported following application of solutions containing benzo[a]pyrene.

Local Emissions of Priority MSATs

It is possible to estimate the relative contributions (by weight of emissions) of the different local sources of priority MSATs using EPA-compiled information. In June 2009, EPA released the results of its National-Scale Air Toxics Assessment for 2002.<sup>22</sup> The purpose of the national-scale assessment was to identify and prioritize those HAPs that present the greatest potential concern in terms of adversely affecting human health. Table 4-29 and Figure 4-23 show that, in Maricopa County, priority pollutants come from on-road mobile sources (such as cars and trucks) and other sources (such as industrial emissions, dry cleaners, gas stations, construction equipment, and train diesel engines).<sup>23</sup>

Regional emissions can exhibit wide local variations. In the Phoenix area, some monitoring data include several priority MSATs. In 2003, a short-term study under the Joint Air Toxics Assessment Project measured ambient levels of benzene; 1,3-butadiene; and formaldehyde in the South Phoenix area (bounded on the north by Van Buren Street, on the south by Chandler Boulevard, on the east by 1st Street, and on the west by 55th Avenue). The annual mean concentrations for these compounds are presented in Table 4-30 (McCarthy et al. 2004).

Emissions data organized and displayed at the county level can mask wide local variations. For example, compare the emissions percentages of benzene; 1,3-butadiene; and formaldehyde in Table 4-29 with the percentages shown for South Phoenix in Table 4-31 (McCarthy et al. 2004; Sullivan et al. 2004). On-road mobile sources represent a smaller portion of these pollutants in South Phoenix compared with Maricopa County as whole.

ENVIRONMENTAL CONSEQUENCES

This section describes air quality analyses completed to address two different needs. First, the project must comply with transportation conformity requirements. Transportation conformity is a CAA requirement that applies to projects funded or approved by FHWA in



**Table 4-30** Annual Priority Mobile Source Air Toxics Concentrations, South Phoenix

| Pollutant     | South Phoenix                    |
|---------------|----------------------------------|
|               | Annual Mean (µg/m³) <sup>a</sup> |
| Benzene       | 3.5                              |
| 1,3-butadiene | 0.5                              |
| Formaldehyde  | 4.2                              |

Source: Joint Air Toxics Assessment Project Report, 2004 (November)

<sup>a</sup> micrograms per cubic meter

nonattainment and maintenance areas for transportation-related criteria pollutants. To meet the project-level conformity requirements, a project must come from a conforming metropolitan transportation plan and transportation improvement program (TIP); its design concept and scope cannot be significantly different from what was modeled as part of the regional emissions analysis associated with the conformity determination for the metropolitan transportation plan and TIP; it must include a hot-spot analysis in CO and PM areas, as required by 40 C.F.R. § 93.123; and it must demonstrate compliance with any control measures in a PM SIP.

For this project, a hot-spot analysis was required for CO and PM<sub>10</sub>. The hot-spot analysis shows that the Preferred Alternative would not cause new violations of the CO and PM<sub>10</sub> NAAQS, exacerbate any existing violations of the standard, or delay attainment of the standards or any required interim milestones [40 C.F.R. § 93.116(a)]. Transportation conformity hot-spot analyses focus on the expected worst-case location along the project corridor; if no violations of the applicable air quality standards are identified at the worst-case location, it is presumed that no violations of the air quality standards would occur anywhere along the corridor.

Second, additional analyses were conducted for NEPA purposes. Additional interchange locations were analyzed for CO and PM<sub>10</sub> to provide information about projected concentrations at other representative locations along the corridor, in response to public concerns.

**Table 4-31** Priority Mobile Source Air Toxics Emissions, South Phoenix

| Pollutant     | On-Road Mobile Sources |            | Other Sources |            | Total     |
|---------------|------------------------|------------|---------------|------------|-----------|
|               | Tons/year              | % of total | Tons/year     | % of total | Tons/year |
| Benzene       | 26.90                  | 25         | 80.60         | 75         | 107.50    |
| 1,3-butadiene | 4.40                   | 9          | 43.46         | 91         | 47.86     |
| Formaldehyde  | 18.90                  | 40         | 28.62         | 60         | 47.52     |

Source: Joint Air Toxics Assessment Project Report, 2004 (December)

This section also includes information about the Preferred Alternative’s impacts on MSATs and greenhouse gases (GHGs).

**Transportation Conformity**  
**Carbon Monoxide Hot-spot Analysis**

The project-level CO hot-spot analysis performed for the DEIS was updated for the FEIS using new socioeconomic projections approved by MAG in June 2013 and EPA’s latest emissions model (MOVES2010b).

EPA’s guidance for MOVES2010b modeling requirements for quantitative analyses of CO was used for this analysis (EPA 2010). The MOVES2010b model is the newly adopted mobile-source emission factor model (replacing the MOBILE6.2 model that was used for the DEIS analysis). MOVES2010b provides great flexibility to capture the influence of time of day, vehicle speeds, and seasonal weather effects on vehicle emission rates. Depending on the availability of project-specific inputs, MOVES2010b calculates a number of emission-related parameters such as total mass emissions, speed-related emission rates, total energy consumption, and vehicle activity (hours operated and miles traveled), among other outputs. From this output, emission rates can be determined for a wide variety of spatial and time scales. At the project level, MOVES2010b requires site-specific input data for traffic volumes and other parameters that can change by time of day or by season of year. By using site-specific data, the emission results reflect the site-specific traffic characteristics in the project area in great detail.

For the transportation conformity hot-spot analysis, the I-10 interchange was identified as the worst-case location. The total traffic volumes at this location are nearly twice as high as at any other interchange associated with the project. The I-10 freeway at this location also is projected to experience level of service (LOS) E or F conditions during both morning and evening peak hours, which leads to higher emissions; no other location along the corridor is expected to experience poor LOS during both the morning and evening peak hours.

Transportation conformity hot-spot analyses must reflect the year of peak emissions over the life of the project. For CO, this is expected to be the project design year of 2035. MAG’s most recent conformity analysis for its regional transportation plan (see Appendix 4-3) indicates that regional emissions of CO will be highest in 2035 (emissions are higher in 2015, but the project would not be constructed by then); traffic volumes associated with the project itself are also expected to be highest in 2035.

The CAL3QHCR dispersion model was used to estimate CO concentrations at receptor locations near the interchange locations (ramp intersections), which represented the highest traffic volumes or worst LOS, or both. Additional details on the analysis may be found in the air quality technical report prepared for the proposed freeway (see sidebar on page 4-2 for information on how to review the report).

The highest modeled CO concentrations at the I-10 interchange for the Preferred Alternative are included in Table 4-32, along with the other interchanges modeled for NEPA purposes. The modeled CO concentrations at all receptor locations were well below the 1-hour and 8-hour CO NAAQS.

**Table 4-32** Highest Modeled Carbon Monoxide Concentrations at the Interstate 10, Broadway Road, and 40th Street Interchanges

| Location  | 1-hour Concentration (ppm <sup>a</sup> ) |                       |                   |                    | 8-hour Concentration (ppm)              |                       |                   |       |
|---|--|-----------------------|-------------------|--------------------|---|-----------------------|-------------------|-------|
|   | Existing Conditions (2012) <sup>b</sup>  | Preferred Alternative |                   | NAAQS <sup>d</sup> | Existing Conditions (2012) <sup>b</sup> | Preferred Alternative |                   | NAAQS |
|   |  | 2020 <sup>c</sup>     | 2035 <sup>c</sup> |                    |   | 2020 <sup>e</sup>     | 2035 <sup>e</sup> |       |
| Clean Air Act Conformity Demonstration                              |  |                       |                   |                    |   |                       |                   |       |
| South Mountain Freeway/ Interstate 10 interchange (W59 Alternative) | 4.8                                      | 5.7 <sup>f</sup>      | 5.5 <sup>f</sup>  | 35                 | 3.9                                     | 4.6 <sup>f</sup>      | 4.4 <sup>f</sup>  | 9     |
| National Environmental Policy Act Analysis                          |  |                       |                   |                    |   |                       |                   |       |
| South Mountain Freeway/Broadway Road interchange (W59 Alternative)  | 4.8                                      | 5.4 <sup>f</sup>      | 5.3 <sup>f</sup>  | 35                 | 3.9                                     | 4.3 <sup>f</sup>      | 4.2 <sup>f</sup>  | 9     |
| South Mountain Freeway/40th Street interchange (E1 Alternative)     | 4.8                                      | 5.5 <sup>f</sup>      | 5.4 <sup>f</sup>  | 35                 | 3.9                                     | 4.3 <sup>f</sup>      | 4.2 <sup>f</sup>  | 9     |

<sup>a</sup> parts per million  
<sup>b</sup> Under existing conditions, the South Mountain Freeway has not been built. The assumed 1-hour and 8-hour concentrations are the background values.  
<sup>c</sup> includes 1-hour background concentration of 4.8 ppm  
<sup>d</sup> National Ambient Air Quality Standards  
<sup>e</sup> includes 8-hour background concentration of 3.9 ppm  
<sup>f</sup> highest modeled carbon monoxide concentration shown for all scenarios across 5 years of meteorological data

Particulate Matter Hot-spot Analysis

In PM<sub>10</sub> nonattainment and maintenance areas, projects that are of “air quality concern” as defined by 40 C.F.R. § 93.123(b) require a hot-spot analysis. The Preferred Alternative is such a project.

As discussed in EPA’s PM hot-spot analysis guidance (EPA 2013), for large projects it is appropriate to focus hot-spot analyses on locations that are likely to have the highest air quality concentrations and that are the most likely to create new or worsened violations of the PM<sub>10</sub> NAAQS. According to EPA’s guidance, if transportation conformity is demonstrated at representative worst-case locations, then it can be assumed that conformity would be met at other locations in the project area where

traffic volumes are lower. As with CO, the I-10 (Papago Freeway) interchange is expected to be the worst-case location for PM<sub>10</sub> because of its high total traffic and truck volumes and the occurrence of poor LOS during peak hours.

Transportation conformity hot-spot analyses must also reflect the year or years of peak emissions over the life of the project. For PM<sub>10</sub>, this is expected to be the project design year of 2035. MAG’s most recent conformity analysis for its regional transportation plan (see Appendix 4-3) indicates that regional emissions of PM<sub>10</sub> will be highest in 2035; traffic volumes associated with the project itself are also expected to be highest in 2035.

The air quality analysis included quantitative modeling to estimate project-specific emission rates from vehicle exhaust, brake and tire wear, and re-entrained road dust attributable to freeway operation. Model inputs for developing emission rates and dispersion modeling parameters were consistent with EPA’s quantitative PM hot-spot analysis guidance (EPA 2013). PM<sub>10</sub> emission rates from MOVES2010b added to re-entrained road dust from EPA’s AP-42, Compilation of Air Pollutant Emission Factors (EPA 2011), were used in the CAL3QHCRCR dispersion model to generate PM<sub>10</sub> concentrations at specific receptor locations. The PM<sub>10</sub> concentrations (including a background concentration) were used to determine whether the mobile source emissions resulting from the project would cause an exceedance of the applicable NAAQS for PM<sub>10</sub> (150 µg/m<sup>3</sup>). Additional details on the analysis may be found in the air quality technical report prepared for the proposed freeway (see sidebar on page 4-2 for information on how to review the report).

Following EPA guidelines for project-level quantitative analyses, vehicle emission rates were developed for the 2035 analysis year for the following months (and hours of the day):

- January (morning, midday, evening, and overnight)
- April (morning, midday, evening, and overnight)
- July (morning, midday, evening, and overnight)
- October (morning, midday, evening, and overnight)

PM<sub>10</sub> design values were derived by adding the sixth-highest modeled 24-hour concentration over the 5-year meteorological data set for each season and hour to the background PM<sub>10</sub> concentration developed for each modeling location. As detailed in EPA guidance, the resulting PM<sub>10</sub> concentration (i.e., the design value plus background PM<sub>10</sub> concentration) was then rounded to the nearest 10 µg/m<sup>3</sup> (EPA 2013).

The PM<sub>10</sub> design value for the I-10 interchange for the Preferred Alternative is included in Table 4-33, along with the other interchanges modeled for NEPA purposes. As shown in Table 4-33, the PM<sub>10</sub> NAAQS would not be exceeded under the worst-case modeling assumptions used in the MOVES2010b and CAL3QHCRCR analyses for PM<sub>10</sub>. All PM<sub>10</sub> design values with the Preferred Alternative did not exceed the 24-hour NAAQS (150 µg/m<sup>3</sup>).

**Conformity Determination**

*Preferred Alternative*

The Study Area currently lies in a nonattainment area for the 2008 8-hour O<sub>3</sub> standard. The Maricopa County area was redesignated to attainment for CO in 2005, and EPA found the Study Area in attainment for the 24-hour PM<sub>10</sub> standard on July 10, 2014.

Since O<sub>3</sub> is a regional pollutant, there is no requirement to analyze potential impacts and no possibility of localized violations of O<sub>3</sub> to occur at the project level. The CO and PM<sub>10</sub> hot-spot analyses described above demonstrate that the proposed project would not contribute to any new local violations, increase the frequency or severity of any existing violation, or delay timely attainment of the NAAQS or any required interim emissions reductions or other milestones.

The project is included in MAG’s fiscal year 2014–2018 TIP and the 2035 RTP, which were found to conform to the O<sub>3</sub>, CO, and PM<sub>10</sub> SIP by USDOT on February 12, 2014. The project is identified in these documents using several different project identification numbers by construction segment (47518, 43086, 43087, 11305, 15671, 19029, 17193, 6458, 1790, 6919, and 47857). The design concept and scope of the Preferred



Alternative are consistent with that used in the regional emissions analysis for the RTP and TIP conformity determinations. The project is consistent with control measures in the PM<sub>10</sub> SIP.

Therefore, based on the CO and PM<sub>10</sub> analyses conducted for the Preferred Alternative, it has been determined that this project would not cause an exceedance of any NAAQS. The analysis demonstrated that the proposed project would not contribute to any new local violations, increase the frequency or severity of any existing violation, or delay timely attainment of the NAAQS or any required interim emissions reductions or other milestones. The project complies with the transportation conformity regulations at 40 C.F.R. Part 93 and with the conformity provisions of Section 176(c) of the CAA.

NEPA Analysis

Carbon Monoxide Hot-spot Analysis

As noted above, a CO hot-spot analysis was performed at additional interchange locations for NEPA purposes. The project-level CO analysis included in the DEIS was updated at the South Mountain Freeway/40th Street (E1 [Preferred] Alternative) and South Mountain Freeway/Broadway Road (W59 [Preferred] Alternative) interchanges with link-specific data. CO emission rates were generated with MOVES2010b for 2020 (opening year) and 2035 (design year). Consistent with the conformity hot-spot analysis, the CAL3QHCR dispersion model was used to estimate CO concentrations at receptor locations near the interchange locations (ramp intersections), which represented the highest traffic volumes or worst LOS, or both.

The results for these two interchange locations are shown in Table 4-32. The modeled CO concentrations at all receptor locations in the vicinity of the two interchange locations were well below the 1-hour and 8-hour CO NAAQS.

The modeled CO concentrations for the FEIS were higher than those reported in the DEIS for several reasons, including the use of higher background concentrations derived from monitoring data over

multiple years (rather than the 2.0 ppm and 1.4 ppm background used in the DEIS for 1-hour and 8-hour concentrations, respectively) and the use of more detailed design-level interchange configurations. Background CO concentrations for the 1-hour and 8-hour scenarios were 140 percent and 179 percent higher, respectively, than those used in the DEIS analyses.

In general, the highest 1-hour CO concentrations were about 35 percent higher than those reported in the DEIS. Similarly, the highest 8-hour concentrations were more than 50 percent higher than those reported in the DEIS. However, even with the higher modeled results (with higher background CO concentrations and more detailed design information), the NAAQS for CO were not violated (Table 4-32).

Particulate Matter Hot-spot Analysis

The same two additional interchange locations were selected for NEPA PM<sub>10</sub> hot-spot modeling based on their proximity to residential developments as well as their traffic volumes.

Table 4-33 shows the PM<sub>10</sub> design values at the analysis locations. As shown in Table 4-33, the PM<sub>10</sub> NAAQS would not be exceeded under the worst-case modeling assumptions used in the MOVES2010b and CAL3QHCR analyses for PM<sub>10</sub>. All PM<sub>10</sub> design values with the Preferred Alternative did not exceed the 24-hour NAAQS (150 µg/m<sup>3</sup>).

Future Trends in Criteria Pollutants

EPA will continue its successful efforts to further reduce vehicle emissions. These programs include reformulated gasoline, the national low-emission vehicle program, Tier II motor vehicle emissions standards, gasoline sulfur control program, heavy-duty diesel engine program, and on-highway diesel sulfur control programs. Two examples follow.

Heavy-duty Diesel Emissions Standards

In December 2000, EPA issued its final rule in a two-part strategy to reduce diesel emissions from heavy-duty trucks and buses. The standards pertain to diesel engines

Table 4-33 Modeled PM<sub>10</sub> Design Values

| Location   | Sixth-highest PM <sub>10</sub> <sup>a</sup> Value (µg/m <sup>3</sup> ) <sup>b,c</sup> | Background PM <sub>10</sub> (µg/m <sup>3</sup> ) | Total Concentration (unrounded) (µg/m <sup>3</sup> ) | Total (rounded to the nearest 10 µg/m <sup>3</sup> ) | NAAQS <sup>d</sup> (µg/m <sup>3</sup> ) |
|--|---|--|--|--|---|
| Clean Air Act Conformity Demonstration                             |   |  |  |  |   |
| South Mountain Freeway/Interstate 10 interchange (W59 Alternative) | 12.9  | 133  | 145.9  | 150  | 150                                     |
| National Environmental Policy Act Analysis                         |   |  |  |  |   |
| South Mountain Freeway/Broadway Road interchange (W59 Alternative) | 5.3   | 131  | 136.3  | 140  | 150                                     |
| South Mountain Freeway/40th Street interchange (E1 Alternative)    | 3.8   | 145  | 148.8  | 150  | 150                                     |

<sup>a</sup> particulate matter less than or equal to 10 microns in diameter  
<sup>b</sup> micrograms per cubic meter  
<sup>c</sup> sixth-highest PM<sub>10</sub> concentration over 5 years of meteorological data  
<sup>d</sup> National Ambient Air Quality Standards

found in such vehicles (weighing over 8,500 pounds), beginning in model year 2004. Additional standards and procedures were implemented in 2007. EPA required diesel fuel refiners to produce diesel fuels (for highway vehicle use) that have a sulfur content of no more than 15 ppm, effective October 2006, a 97 percent reduction from the previous 500 ppm level.

Tier 3 Motor Vehicle Emission and Fuel Standards

In April 2014, EPA finalized its Tier 3 Motor Vehicle Emission and Fuel Standards. The program considers the vehicle and its fuel as an integrated system, setting new vehicle emissions standards and lowering the sulfur content of gasoline beginning in 2017. The vehicle standards will reduce both tailpipe and evaporative emissions from passenger cars, light-duty trucks, medium-duty passenger vehicles, and some heavy-duty vehicles. The gasoline sulfur standard will enable more stringent

vehicle emissions standards and will make emissions control systems more effective. Not only will the updated regulations reduce criteria pollutants, they will also reduce MSATs, which are discussed in the next section. Because these new standards have not yet been incorporated into EPA’s MOVES emissions model, they are not reflected in the air quality analyses discussed in this document.

Mobile Source Air Toxics

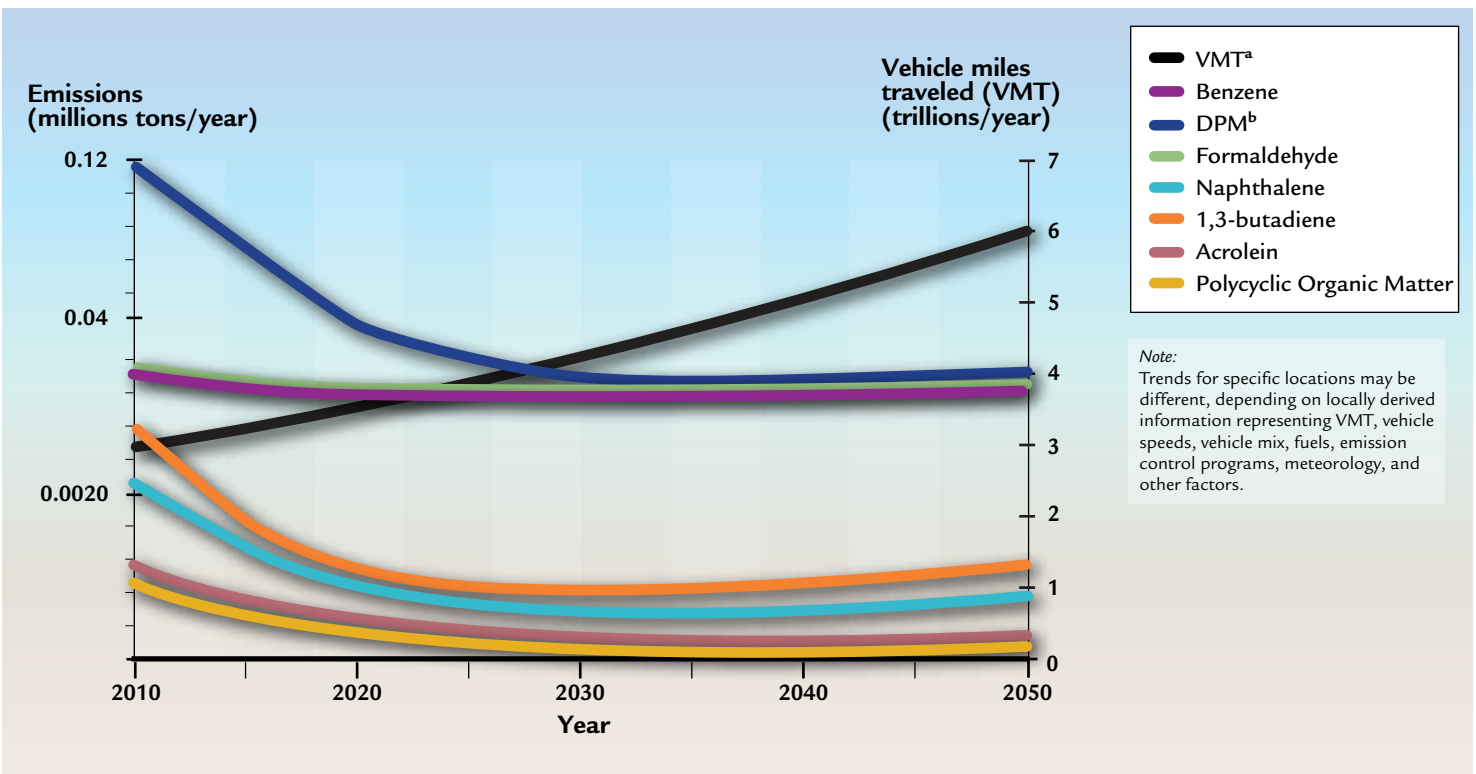
Controlling air toxic emissions became a national priority with the passage of the CAA Amendments of 1990, whereby Congress mandated that EPA regulate 188 air toxics, also known as HAPs. EPA has assessed this expansive list in its latest rule on the *Control of Hazardous Air Pollutants from Mobile Sources* (*Federal Register* 72(37):8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are listed in its Integrated Risk Information System <epa.gov/iris/>. In addition, EPA identified seven compounds with significant contributions from mobile sources that are among the national- and regional-scale cancer risk drivers from its 1999 National Air Toxics Assessment <epa.gov/ttn/atw/nata1999/>. These are acrolein; benzene; 1,3-butadiene; DPM plus diesel exhaust organic gases; formaldehyde; naphthalene; and POM. While FHWA considers these the priority MSATs, the list is subject to change and may be adjusted in consideration of future EPA rules.

Emissions Model

The FEIS analysis updated the DEIS MSAT analysis by evaluating MSATs with the MOVES2010b model for the No-Action and Preferred Alternatives. The MSAT analysis was performed using guidance and methodologies found in FHWA’s MSAT guidance (FHWA 2012) and discussions with FHWA technical staff.<sup>24</sup>

Based on an FHWA analysis using EPA’s MOVES2010b model, as shown in Figure 4-24, even if VMT increases by 102 percent as assumed from 2010 to 2050, a combined reduction of 83 percent in the total annual emissions for the priority MSATs is projected for the same time period.

Figure 4-24 National Mobile Source Air Toxics Emission Trends, 1999–2050



Source: U.S. Environmental Protection Agency MOVES2010b model runs conducted from May to June 2012 by the Federal Highway Administration

<sup>a</sup> vehicle miles traveled  
<sup>b</sup> diesel particulate matter

Regulatory initiatives have and will continue to result in reductions of mobile source air toxics (MSATs) emissions in the near term. As vehicle miles traveled steadily increase, MSAT emissions will rise only gradually.

MSAT Emissions Trends

Computer modeling was used to compare the projected emission trends of the Preferred and No-Action Alternatives. The Study Area was divided into two geographic subareas, as shown in Figure 4-25, and emissions trends were modeled for the two subareas. The Eastern Subarea encompassed the general vicinity near Pecos Road, while the Western Subarea covered areas along the three Western Section action alternatives’ proposed alignments. The No-Action Alternative was also modeled for both subareas. In addition, emissions trends were modeled for the entire Study Area, which included both subareas. All modeling was performed for an interim year (2025) and for the proposed freeway’s design year (2035).

A Study Area emissions inventory analysis was conducted to estimate annual emissions (in tons per year) of MSATs emitted from vehicles in the Study Area as well as in the Western and Eastern Subareas. MSATs modeled were acrolein; benzene; 1,3 butadiene; DPM and diesel exhaust organic gases; formaldehyde; naphthalene; and POM. POM consists of 30 individual pollutants in gaseous and particle form.

MSAT emissions were estimated with MOVES2010b using the average annual daily traffic (AADT) for each freeway, primary arterial street, secondary arterial street, and collector street in the region and the average daily vehicle speed. All roads in each area for which AADT volumes were available from MAG were included in the analysis; in the DEIS, only roads that experienced a substantial change in traffic volume (defined as 5 percent)



attributable to the project were included. Therefore, the analysis in this report represents total MSAT emissions within the project study area and each subarea rather than emissions from only the substantially affected portions of the network within each area. Local inputs for vehicle age distribution, vehicle mix, meteorology, and fuel data were consistent with inputs used for the PM<sub>10</sub> hot-spot analysis. MSAT emissions of each pollutant were calculated for each link and were converted to annual emissions (in tons per year).

Subarea Emissions Impacts

The modeling results for the Western and Eastern Subareas show that future priority MSATs emissions for the Preferred Alternative would be substantially lower than the 2012 MSAT emissions even with increases in VMT of over 60 percent. Reductions of up to 91 percent in MSATs emissions (DPM) are projected for the future years. Results of the modeling are presented in Tables 4-34 and 4-35.

In the Western Subarea, the projected priority MSATs emissions for the Preferred Alternative during 2025 and 2035 would range from 47 to 89 percent lower and 53 to 91 percent lower than 2012 levels, respectively, depending on the pollutant. The projected priority MSATs emissions for the No-Action Alternative during 2025 and 2035 would range from 51 to 90 percent lower and 56 to 92 percent lower than 2012 levels, respectively, depending on the pollutant.

In the Eastern Subarea, the projected priority MSATs emissions for the E1 (Preferred) Alternative during 2025 and 2035 would range from 48 to 89 percent lower and 51 to 91 percent lower than 2012 levels, respectively, depending on the pollutant. The projected priority MSATs emissions for the No-Action Alternative during 2025 and 2035 would range from 54 to 90 percent lower and 60 to 92 percent lower than 2012 levels, respectively, depending on the pollutant.

Study Area Emissions Impacts

The Study Area emissions modeling demonstrated that future-year MSAT emissions in the regional area (assuming build-out of the Preferred Alternative) would

be lower than the 2012 emission estimates, even with a 47 percent increase in regional VMT in 2035 (Table 4-36).

In the Study Area, constructing the Preferred Alternative would have a marginal effect on annual emissions in 2025 and 2035 (less than a 1 percent difference in total annual emissions between the Preferred Alternative and No-Action Alternative). In 2025 and 2035, total Study Area emissions would decrease by more than 80 percent compared with 2012 emissions.

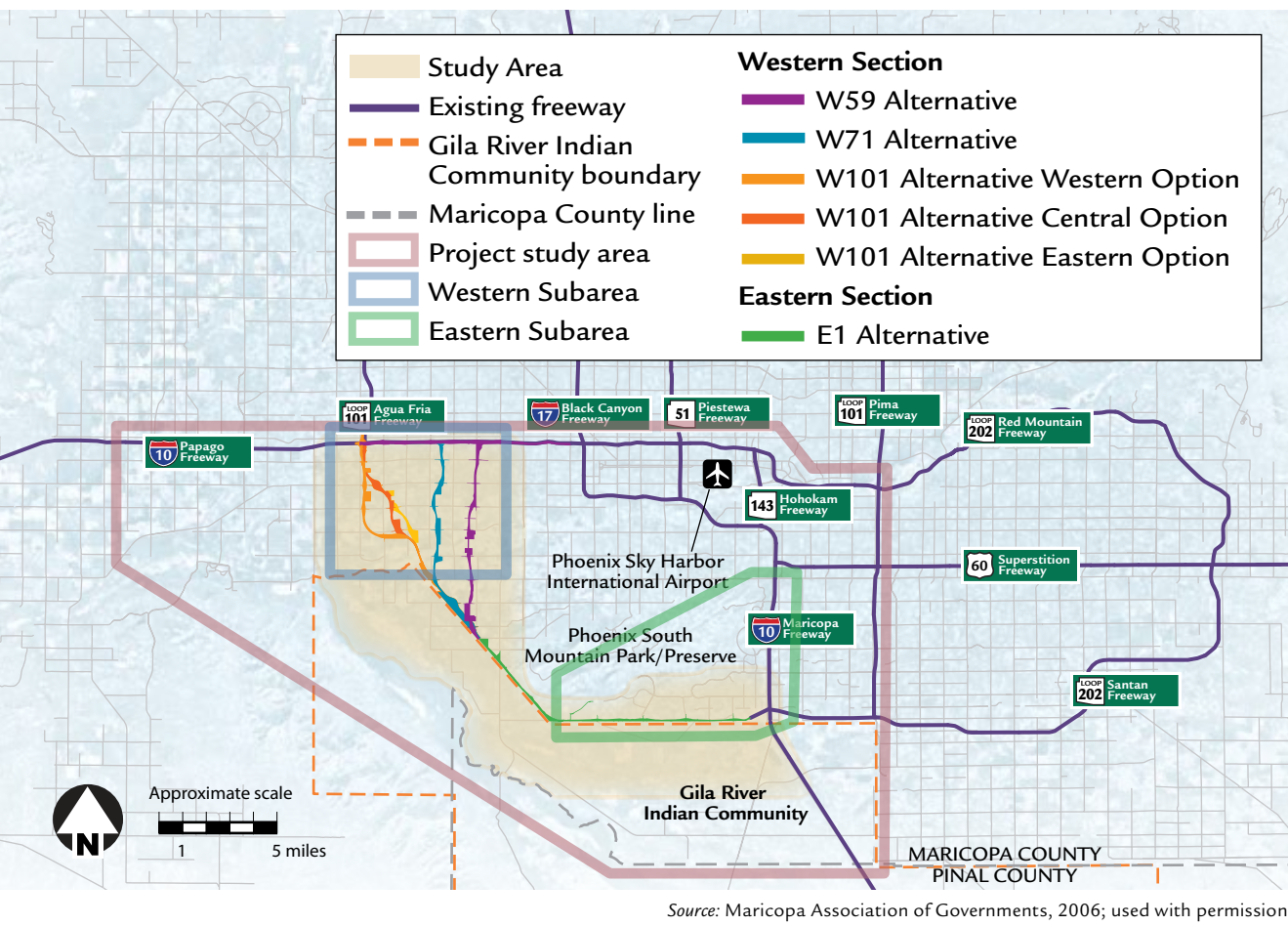
With the Preferred Alternative in 2035, modeled MSAT emissions in the Study Area in 2035 would decrease from 57 to 92 percent, with a 47 percent increase in VMT compared with 2012 conditions.

Another consideration with respect to health impacts is that the Preferred Alternative would also reduce in-vehicle MSATs exposure as opposed to the No-Action Alternative. EPA has found that in-vehicle benzene concentrations were between 2.5 and 40 times higher than nearby ambient concentrations, based on a review of studies discussed in the Regulatory Impact Analysis for EPA’s 2007 MSATs rule-making (Final Regulatory Impact Analysis, Environmental Protection Agency 420-R-07-002, 3-17 [February 2007]). Construction of the Preferred Alternative would result in a reduction in benzene exposure to drivers and passengers for two reasons: decreased travel times (motorists would spend less time in traffic to reach their destinations; this is documented in the *Traffic Overview* [see sidebar on page 4-2 for information on how to review the report]) and lower emissions rates (attributable to speed improvements). These effects would be offset somewhat if induced travel beyond that reflected in the MAG travel demand model were to occur. Reducing on-road exposure would provide a health benefit for motorists using the roadway network.

Health Risk Contributions from Highway Projects

Prior to issuance of the DEIS, EPA requested that FHWA conduct an MSAT health risk assessment for this project, and provided examples for two port-related projects in California. FHWA reviewed these studies,

Figure 4-25 Modeled Assessment Areas, Mobile Source Air Toxics, Maricopa County



Projected mobile source air toxics emissions trends for the action and No-Action alternatives were modeled using two geographic subareas to provide meaningful areas of comparison between 2012 and future conditions (2025 and 2035).

along with a health risk assessment performed for roadway expansion projects related to the relocation of several thousand U.S. Marines to the island of Guam, and a fourth analysis for a hypothetical roadway under a National Cooperative Highway Research Program research project. FHWA’s review focused on the methodologies used in the studies and the findings related to the incremental health risk attributable to the projects.

All four of the health risk assessments involved very conservative assumptions regarding emissions and exposure. For example, each of the studies assumes constant near-term emissions rates, even though national

Table 4-34 Modeled Mobile Source Air Toxics Emissions, Preferred Alternative (W59/E1), Western Subarea

| Parameter  | 2012               | 2025                  |                      |                       |                      | 2035                  |                      |                       |                      |
|--|--------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
|  | Existing Condition | No-Action Alternative |                      | Preferred Alternative |                      | No-Action Alternative |                      | Preferred Alternative |                      |
|  |                    | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) |
| Daily VMT <sup>a</sup>                                     | 2,844,982          | 3,703,135             | 30                   | 4,064,354             | 43                   | 4,128,574             | 45                   | 4,371,887             | 54                   |
| Mobile Source Air Toxic Compound Emissions (tons per year) |                    |                       |                      |                       |                      |                       |                      |                       |                      |
| Benzene  | 4.99               | 2.46                  | -51                  | 2.66                  | -47                  | 2.21                  | -56                  | 2.33                  | -53                  |
| 1,3-butadiene  | 0.84               | 0.39                  | -54                  | 0.42                  | -50                  | 0.35                  | -58                  | 0.37                  | -56                  |
| Formaldehyde   | 5.64               | 1.95                  | -65                  | 2.10                  | -63                  | 1.85                  | -67                  | 1.93                  | -66                  |
| Acrolein   | 0.37               | 0.09                  | -76                  | 0.09                  | -76                  | 0.08                  | -78                  | 0.08                  | -78                  |
| Polycyclic Organic Matter                                  | 0.30               | 0.07                  | -77                  | 0.08                  | -73                  | 0.06                  | -80                  | 0.07                  | -77                  |
| Naphthalene  | 0.69               | 0.23                  | -67                  | 0.24                  | -65                  | 0.21                  | -70                  | 0.22                  | -68                  |
| Diesel Particulate Matter                                  | 31.86              | 3.23                  | -90                  | 3.46                  | -89                  | 2.63                  | -92                  | 2.72                  | -91                  |
| Total Mobile Source Air Toxics                             | 44.69              | 8.42                  | -81                  | 9.05                  | -80                  | 7.39                  | -83                  | 7.72                  | -83                  |

<sup>a</sup> vehicle miles traveled

Table 4-35 Modeled Mobile Source Air Toxics Emissions, Preferred Alternative (W59/E1), Eastern Subarea

| Parameter  | 2012               | 2025                  |                      |                       |                      | 2035                  |                      |                       |                      |
|--|--------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
|  | Existing Condition | No-Action Alternative |                      | Preferred Alternative |                      | No-Action Alternative |                      | Preferred Alternative |                      |
|  |                    | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) |
| Daily VMT <sup>a</sup>                                     | 2,178,414          | 2,624,862             | 20                   | 3,066,877             | 41                   | 2,849,452             | 31                   | 3,538,835             | 62                   |
| Mobile Source Air Toxic Compound Emissions (tons per year) |                    |                       |                      |                       |                      |                       |                      |                       |                      |
| Benzene  | 3.79               | 1.75                  | -54                  | 1.98                  | -48                  | 1.53                  | -60                  | 1.86                  | -51                  |
| 1,3-butadiene  | 0.63               | 0.28                  | -56                  | 0.31                  | -51                  | 0.24                  | -62                  | 0.30                  | -52                  |
| Formaldehyde   | 4.27               | 1.39                  | -67                  | 1.55                  | -64                  | 1.28                  | -70                  | 1.52                  | -64                  |
| Acrolein   | 0.28               | 0.06                  | -78                  | 0.07                  | -75                  | 0.05                  | -82                  | 0.06                  | -79                  |
| Polycyclic Organic Matter                                  | 0.23               | 0.05                  | -78                  | 0.06                  | -74                  | 0.04                  | -83                  | 0.06                  | -74                  |
| Naphthalene  | 0.52               | 0.16                  | -69                  | 0.18                  | -65                  | 0.14                  | -73                  | 0.17                  | -67                  |
| Diesel Particulate Matter                                  | 24.15              | 2.30                  | -90                  | 2.54                  | -89                  | 1.82                  | -92                  | 2.13                  | -91                  |
| Total Mobile Source Air Toxics                             | 33.87              | 5.99                  | -82                  | 6.69                  | -80                  | 5.10                  | -85                  | 6.10                  | -82                  |

<sup>a</sup> vehicle miles traveled

projections by EPA and the emissions analysis for this project show that there will be a large decline in emissions over the lifetime of the project. Likewise, all four of the modeling studies assume constant breathing of outdoor air at a fixed location for either 30 years (one study) or 70 years (three studies). They assume that people will not change residence (which occurs every 8 years on average in the United States), change jobs (which occurs every 3 years on average), or travel to different parts of a metropolitan area over the course of a given day (even though people travel 26 miles per day on average). The studies even assume that students will remain at elementary schools 24 hours a day for 30 or 70 years. These assumptions are not realistic and introduce a considerable amount of uncertainty into the results.

Even with these conservative assumptions, the four studies all report very low risk. Estimated incremental cancer risk from vehicle traffic at the worst-case location in each study ranged from 0.08 cases of cancer per million people to 2 cases per million people. As a point of reference, the risk management framework in EPA’s Air Toxics Risk Assessment Reference Library defines risk levels between one in a million and 100 in a million as “acceptable.” (A risk level of “one in a million” is frequently mentioned in discussions of cancer risk, but under EPA risk assessment guidelines, this represents a level below which risk is considered “negligible” and is not a standard or other type of pass/fail threshold.) For non-cancer health risks, EPA uses a metric known as the “hazard quotient,” where the estimated risks for each pollutant are added together, and a total of less than 1 is considered acceptable. Each of the locations modeled in three of the studies had hazard quotients from vehicle emissions of less than 1, in most cases much less; the remaining study did not calculate a hazard quotient. In short, none of these health risk assessments for major roadway projects (including the two examples provided by EPA) identified health risks in excess of the “acceptable” thresholds in EPA’s risk management framework.



To help put these low health risks from roadway emissions into perspective, FHWA compared them with health risks from traffic fatalities. In 2010, there were 2.47 million deaths in the United States, and 32,728 of these were due to traffic fatalities, meaning that the risk of dying in a traffic accident in 2010 was 0.0106 percent. Converted to terms of risk per million people, this represents a risk of 106 in a million per year, or 7,420 in a million as a 70-year lifetime risk, consistent with cancer risk estimation. While this risk is very high, and while FHWA is actively working to improve highway safety, most people seem to consider this risk “acceptable” in the sense that they do not avoid vehicle trips to reduce it.<sup>25</sup> Also, if the MSAT risk estimates in the studies summarized above are correct, it means that the incremental risk of cancer from breathing air near a major roadway is several hundred times lower than the risk of a fatal accident from using a major roadway.

EPA must make decisions regarding acceptable risk when it develops regulations to control hazardous air pollutants (air toxics) under Titles II and III of the CAA. EPA’s National Emission Standards for Hazardous Air Pollutants for benzene emissions is based on attaining a risk level of no more than 100 cases of cancer per million people. EPA’s 2007 MSATs rule, covering vehicles, fuels, and fuel containers, is designed to result in a remaining risk of approximately 5 in a million.<sup>26</sup> Both of these risk levels, considered acceptable by EPA as an outcome of its rulemaking processes, are much higher than the estimated risk from the highway projects that FHWA reviewed. For more information related to health risk assessments in the NEPA context, see the text box on the following page.

MSAT Information Status

What is known about MSATs is still evolving. FHWA is working with stakeholders, EPA, and others to better understand the strengths and weaknesses of developing analysis tools and the applicability on the project-level decision documentation process. Human epidemiology and animal toxicology experiments indicate that many chemicals or mixtures termed air toxics have

Table 4-36 Modeled Mobile Source Air Toxics Emissions, Preferred Alternative (W59/E1), Project Study Area

| Parameter  | 2012               | 2025                  |                      |                       |                      | 2035                  |                      |                       |                      |
|--|--------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|-----------------------|----------------------|
|  | Existing Condition | No-Action Alternative |                      | Preferred Alternative |                      | No-Action Alternative |                      | Preferred Alternative |                      |
|  |                    | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) | Modeled Value         | Change from 2012 (%) |
| Daily VMT <sup>a</sup>                                     | 19,518,246         | 24,082,899            | 23                   | 23,935,323            | 23                   | 28,179,357            | 44                   | 28,623,078            | 47                   |
| Mobile Source Air Toxic Compound Emissions (tons per year) |                    |                       |                      |                       |                      |                       |                      |                       |                      |
| Benzene  | 34.59              | 15.86                 | –54                  | 15.71                 | –55                  | 14.97                 | –57                  | 14.94                 | –57                  |
| 1,3-butadiene  | 5.79               | 2.51                  | –57                  | 2.49                  | –57                  | 2.37                  | –59                  | 2.40                  | –59                  |
| Formaldehyde   | 39.21              | 12.52                 | –68                  | 12.38                 | –68                  | 12.37                 | –68                  | 12.44                 | –68                  |
| Acrolein   | 2.54               | 0.56                  | –78                  | 0.55                  | –78                  | 0.53                  | –79                  | 0.53                  | –79                  |
| Polycyclic Organic Matter                                  | 2.11               | 0.47                  | –78                  | 0.47                  | –78                  | 0.44                  | –79                  | 0.44                  | –79                  |
| Naphthalene  | 4.78               | 1.46                  | –69                  | 1.45                  | –70                  | 1.39                  | –71                  | 1.40                  | –71                  |
| Diesel Particulate Matter                                  | 221.23             | 19.85                 | –91                  | 20.43                 | –91                  | 17.48                 | –92                  | 17.54                 | –92                  |
| Total Mobile Source Air Toxics                             | 310.25             | 53.23                 | –83                  | 53.48                 | –83                  | 49.55                 | –84                  | 49.69                 | –84                  |

<sup>a</sup> vehicle miles traveled

the potential to affect human health. As toxicology, epidemiology, and air contaminant measurement techniques have improved over the decades, scientists and regulators have increased their focus on the levels of each chemical or material in the air in an effort to link potential exposures with potential health effects. EPA’s list of 21 mobile source toxics represents its prioritization of these chemicals or materials for further study and evaluation. EPA’s strategy for evaluating air toxic compounds effects is focused on both national trends and local impacts.

Air toxics emissions from mobile sources have the potential to affect human health and often represent a regulatory agency concern (see text box on children’s health on page 4-83). FHWA has responded to this concern by developing an integrated research program to answer the most important transportation community questions related to air toxics, human health, and the NEPA process. To this end, FHWA has performed,

funded, or is currently managing several research projects. Many of these projects are based on an Air Toxics Research Workplan that provides a roadmap for agency research efforts (<fhwa.dot.gov/environment/air\_quality/air\_toxics/research\_and\_analysis/workplan/index.cfm>). These efforts include the studies discussed in the following sections.

National Near Roadway MSAT Study

FHWA, in conjunction with EPA and a consortium of State departments of transportation, studied the concentration and physical behavior of MSATs and mobile source PM<sub>2.5</sub> in Las Vegas, Nevada, and Detroit, Michigan. The study criteria dictated that the study site be open to traffic and have 150,000 AADT or more. These studies were intended to provide knowledge about the dispersion of MSAT emissions, with the ultimate goal of enabling more informed transportation and environmental decisions at the project level. These studies are unique in that the monitored data were collected for an entire year. Both the Las Vegas and

The Role of Health Risk Assessment in a National Environmental Policy Act Context

FHWA’s NEPA documents are developed under two guiding sets of regulations: the Council on Environmental Quality’s (CEQ’s) NEPA regulations applicable to all federal agencies (40 C.F.R. Parts 1500–1508) and FHWA’s implementing regulations governing its NEPA documents (23 C.F.R. Part 771). In its MSATs guidance, FHWA discusses 40 C.F.R. Part 1502.22 and acknowledges that while much work has been done to assess the overall health risk of MSATs, analytical tools and techniques for assessing project-specific health outcomes as a result of lifetime exposures to MSATs remain limited. These limitations impede the ability to evaluate the potential health risks attributable to exposure to MSATs as part of the decision-making process in the NEPA context. However, as with any analysis that FHWA conducts for NEPA purposes, FHWA’s approach for MSAT analysis in NEPA documents is informed not just by 40 C.F.R. Part 1502.22 but by all applicable CEQ requirements.

The appropriateness of air toxics health risk assessment as an analysis method for NEPA documents is discussed below, in the context of CEQ requirements for these documents. In addition to the 40 C.F.R. Part 1502.22 provisions regarding uncertainty and limitations discussed in FHWA’s MSAT Interim Guidance Appendix C, three other provisions of the CEQ regulations are particularly relevant to the topic of health risk assessment:

40 C.F.R. § 1500.1(b): *NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail.*

40 C.F.R. § 1502.1: *An environmental impact statement is more than a disclosure document. It shall be used by Federal officials in conjunction with other relevant material to plan actions and make decisions.*

40 C.F.R. § 1502.2: (a) *Environmental impact statements shall be analytic rather than encyclopedic. (b) Impacts shall be discussed in proportion to their significance. (c) Environmental impact statements shall be kept concise and shall be no longer than absolutely necessary to comply with NEPA and with these regulations.*

Section 1500.1(b) states that information for decision making must be of high quality and based on accurate scientific analysis. Air toxics health risk assessments can involve large uncertainties. The MSAT health risk assessment uncertainty builds on itself—each step of the analysis involves uncertainties, including modeling traffic and then modeling emissions, using this estimated output to model dispersion/concentrations, which provide information for estimating or assuming exposures to those concentrations, and finally predicting health outcomes. Major uncertainties are associated with traffic and emissions projections over a 70-year period, and dispersion models are typically held to a “factor of 2” performance standard. Health impacts of MSATs in the EPA Integrated Risk Information System are based on a 70-year lifetime exposure, which introduces significant uncertainty. It is particularly difficult to reliably forecast 70-year lifetime MSAT concentrations and exposure near roadways, to determine the portion of time that people are actually exposed at a specific location, and to establish the extent attributable to a proposed action, especially given that some of the information needed is unavailable. Finally, EPA’s Integrated Risk Information System provides toxicity (risk) values for

various pollutants and routes of exposure; in a health risk assessment, FHWA would compare calculated concentrations of MSAT pollutants to the Integrated Risk Information System values to estimate health risk. In the Integrated Risk Information System, EPA states the toxicity values are believed to be accurate to within an order of magnitude (a factor of 10). The total cumulative uncertainty involved in highway project health risk assessment is much larger than the change in emissions attributable to projects (typically a few percentage points). In this context, the information would not necessarily have a strong nexus to the requirements for high-quality information and accurate scientific analysis.

Section 1500.1(b) also directs agencies to focus their NEPA analysis and documentation on issues that are truly significant to the action in question. In the context of MSATs, FHWA must consider whether changes in MSAT emissions attributable to a project have the potential for significant health risk. Using cancer risk as an example, EPA estimates that the overall risk of cancer in the United States is approximately 330,000 in a million, and that air toxics (from all sources) are responsible for a risk of approximately 50 in a million. In its most recent MSATs rule-making, EPA estimated MSAT cancer risk, after implementation of emissions controls, at approximately 5 in a million (or 0.0015 percent of overall cancer risk from any cause).

In summary, available information from EPA indicates that MSATs are a small component of overall cancer risk, and the analysis for the FEIS indicates both that the Preferred Alternative would result in a small change in the emissions contributing to this risk and that emissions will decline by a large amount regardless of alternative.

As described above and in the air quality technical report (see sidebar on page 4-2 for information on how to review the report), results from the health risk assessment would be influenced more by the uncertainty introduced into the process through assumptions and speculation rather than by genuine insight into the actual health impacts directly attributable to MSAT exposure associated with a project. Therefore, outcomes of such a health risk assessment do not provide useful information for decision makers, as required by Section 1502.1. The FHWA emissions analysis meets the requirement to produce information that is useful for both disclosure and decision making because it allows the public and decision makers to see which alternative has less MSAT emissions, with much less uncertainty than a health risk assessment.

Given the uncertainty of an MSAT health risk assessment, FHWA instead addresses the potential impacts of MSATs through an emissions assessment in its NEPA documents. For smaller projects with a lower likelihood of a meaningful impact, this discussion is qualitative. For larger projects, emissions analysis is conducted. The FHWA approach is consistent with CEQ’s direction in Section 1502.2(b) to discuss impacts in proportion to their significance. The results of an emissions analysis can be summarized concisely in a NEPA document and provide useful information for decision makers (e.g., an alternative that has lower emissions is likely to be “better” from an MSATs health risk standpoint than one that has higher emissions). While EPA and FHWA both agree on the usefulness of addressing MSATs in NEPA documents for highway projects, the agencies disagree about the value of health risk assessment as a method for doing so.

Detroit reports revealed there are a large number of influences in an urban setting and researchers must look beyond the roadway to find all the sources in the near-road environment. For example, in both locations, meteorology played a large role in the concentrations measured in the near-road study area. More information is available at <[fhwa.dot.gov/environment/air\\_quality/air\\_toxics/research\\_and\\_analysis/near\\_road\\_study/index.cfm](http://fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/near_road_study/index.cfm)>.

**Traffic-related Air Pollution**  
**Going One Step Beyond: A Neighborhood Scale Air Toxics Assessment in North Denver (The Good Neighbor Project)**  
In 2007, the Denver Department of Environmental Health issued a technical report entitled *Going One Step Beyond: A Neighborhood Scale Air Toxics Assessment in North Denver (The Good Neighbor Project)*. This research project was

funded by FHWA. In this study, the Denver Department of Environmental Health conducted a neighborhood-scale air toxics assessment in North Denver, which includes a portion of the proposed Interstate 70 East project area. Residents in this area have been very concerned about both existing health effects in their neighborhoods (from industrial activities, hazardous waste sites, and traffic) and potential health impacts from changes to Interstate 70.



Addressing Children’s Health in a National Environmental Policy Act Context

A common theme in public comments on the proposed project has been the potential impacts of the project on children’s health, primarily through vehicle emissions and noise. Many commenters raised concerns about the proximity of the project to schools or other aspects of the project that may affect children. In addition, EPA requested that the FEIS address Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks.

Throughout the FEIS, potential impacts on and subsequent mitigation for human health are disclosed and identified, as inherent in the EIS process. The FEIS incorporates an assessment of the potential impacts of the proposed project on all populations, including children. The FEIS addresses potential impacts of the project on children in the Chapter 4 environmental consequences analyses.

EPA’s Toxicity and Exposure Assessments for Children’s Health report (see page 4-73 of the FEIS) indicated that indoor air concentrations of benzene are usually higher than outdoor levels and that indoor air in smokers’ homes is a significant contributor to children’s exposures. It mentioned children when identifying the effects of acute exposure to naphthalene. The FEIS acknowledges and fully discloses public scoping comments that raised the topic of health effects on neighborhoods and adjacent schools (see page 4-31 of the FEIS).

The FEIS evaluates CAA criteria air pollutant concentrations in Maricopa County and the Phoenix area (see pages 4-75 to 4-77 of the FEIS). With regard to air quality impacts, the FEIS addresses children’s health impacts within the broader discussion regarding health impacts under the NAAQS. CAA Section 109(b)(1) requires EPA to promulgate primary NAAQS at levels that allow an adequate margin of safety and are requisite to protect the public health. As noted by EPA in its 2013 rulemaking for PM, CAA Section 109’s legislative history demonstrates that the primary standards are “to be set at the maximum permissible ambient air level ... which will protect the health of any [sensitive] group of the population” (78 *Federal Register* 3086 and 3090) (quoting S. Rep. No. 91-1196, 91st Cong., 2 Sess. 10 [1970]) (alterations in original). Accordingly, the FEIS NAAQS-based evaluation of criteria air pollutants includes a health-based review of sensitive populations, including children, given the NAAQS inherent consideration of those factors. Furthermore, the NAAQS-based assessment ensures adequate consideration of health-based issues as “[t]he requirement that primary standards provide an adequate margin of safety was intended to address uncertainties associated with inconclusive scientific and technical information ... and to protect against hazards that research has not yet identified” (78 *Federal Register* 3090).

Sensitive receivers for air and noise are already included in the air quality and noise analyses in accordance with State and federal guidance. Both sections, *Air Quality* and *Noise*, beginning on FEIS pages 4-68 and 4-88, respectively, have addressed requirements under NEPA. As stated on page 4-89 of the FEIS, over 220 sensitive

receivers were evaluated at exterior locations from a traffic noise perspective. All of the receivers represent noise-sensitive land uses in proximity to the proposed project, including homes, schools, and parks, and these receivers would have higher noise levels than similar facilities more distant from the proposed action.

Each modeled school was reexamined to determine whether noise impacts would result from the proposed freeway and whether appropriate mitigation of these impacts was provided. Of the nine schools modeled in the analysis for the FEIS, all were predicted to exceed FHWA noise abatement criteria (NAC) (see Table 4-40, beginning on page 4-93). Mitigation, in the form of noise walls, was proposed for all schools. After applying this mitigation, all schools except one were mitigated according to the ADOT noise policy. According to ADOT policy, noise mitigation should achieve a reduction of 5 to 7 A-weighted decibels (dBA) and result in a noise level of less than 64 dBA for residential and similar areas. These criteria were not reached for one school (receiver 67, Santa Maria Elementary School) because the policy limits wall heights to 20 feet. A wall taller than 20 feet would be required to bring levels at this receiver down to 64 dBA. However, a 5-dBA reduction would be provided by the 20-foot wall proposed in this area. It is important to note that this receiver would be affected only by the W71 Alternative, which is not the Preferred Alternative.

The ADOT noise policy also states that noise abatement shall be considered if “substantial increases” (defined as a 15 dBA or greater increase) are predicted. Of the nine schools modeled, substantial increases were predicted at six schools. As discussed above, however, noise walls would reduce noise levels at all schools according to the ADOT noise policy, with the exception of Santa Maria Elementary School, which would be affected only by the W71 Alternative, which is not the Preferred Alternative. According to FHWA’s 1995 Highway Traffic Noise Analysis and Abatement Policy and Guidance, in most cases, if the exterior area can be protected, the interior will also be protected.

Receptor placement met the criteria for selecting modeling locations as specified in 40 C.F.R. § 93.123(a). The CO analysis was updated in the FEIS. Although a qualitative analysis of PM<sub>10</sub> was presented in the DEIS, a quantitative project-level PM<sub>10</sub> hot-spot analysis is included in the FEIS. The results of the air quality updates are summarized in the prologue to the FEIS (page xiii) and are more fully described beginning on page 4-68 of the FEIS. The CO and PM<sub>10</sub> analyses demonstrated that the proposed freeway would not contribute to any new localized violations, increase the frequency or severity of any existing violation, or delay timely attainment of the NAAQS or any required interim emissions reductions or other milestones. Through analysis, FHWA has determined that the proposed project would not produce disproportionate impacts on children.

The study was designed to compare modeled levels of the six priority MSATs identified in FHWA’s 2006 guidance with measurements at existing MSAT monitoring sites in the study area. MOBILE6.2 emissions factors and the ISC3ST dispersion model were used (some limited testing of the CALPUFF model was also performed). Key findings include: 1) modeled mean annual concentrations from highways were well below estimated Integrated Risk Information System cancer and noncancerous risk values for all six MSATs, 2) modeled concentrations dropped off sharply within 50 meters of roadways, 3) modeled MSAT

concentrations tended to be higher along highways near the Denver Central Business District than along the Interstate 70 East corridor (in some cases, they were higher within the business district itself, as were the monitored values), and 4) dispersion model results were generally lower than monitored concentrations but within a factor of 2 at all locations.

Mobile Source Air Toxic Hot Spot

Given concerns about the possibility of MSAT exposure in the near-road environment, the Health Effects Institute

(HEI) dedicated a number of research efforts at trying to find an MSAT “hot spot.” In 2011, three studies were published that tested this hypothesis. In general, the authors confirm that while highways are a source of air toxics, they were unable to find that highways were the only source of these pollutants. They determined that near-road exposures were often no different or no higher than background or ambient levels of exposure and, hence, no true hot spots were identified. Additional information may be found at <[pubs.healtheffects.org/getfile.php?u=659](http://pubs.healtheffects.org/getfile.php?u=659)> on page 137, <[pubs.healtheffects.org/getfile.php?u=656](http://pubs.healtheffects.org/getfile.php?u=656)> on page 143,

and <pubs.healtheffects.org/getfile.php?u=617> on page 88, where monitored on-road emissions were higher than emission levels monitored at near-road residences, but the issue of hot spots was not ultimately discussed.

**Traffic-related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects**

In January 2010, HEI released Special Report #17, investigating the health effects of traffic-related air pollution. The goal of the research was to synthesize available information on the effects of traffic on health. Researchers looked at linkages between 1) traffic emissions (at the tailpipe) with ambient air pollution in general, 2) concentrations of ambient pollutants with human exposure to pollutants from traffic, 3) exposure to pollutants from traffic with human-health effects and toxicological data, and 4) toxicological data with epidemiological associations. Challenges in making exposure assessments, such as quality and quantity of emissions data and models, were investigated, as was the appropriateness of the use of proximity as an exposure-assessment model. Overall, researchers felt that there was “sufficient” evidence for causality for the exacerbation of asthma. Evidence was “suggestive but not sufficient” for other health outcomes such as cardiovascular mortality and others. Study authors also noted that past epidemiological studies may not provide an appropriate assessment of future health associations because vehicle emissions are decreasing over time. The report is available at <pubs.healtheffects.org/view.php?id=334>. FHWA provides financial support to HEI’s research work.

**Health Effects Institute Special Report #16**

In November 2007, HEI published Special Report #16: Mobile-Source Air Toxics: A Critical Review of the Literature on Exposure and Health Effects. The purpose of this report was to accomplish the following tasks:

- Use information from the peer-reviewed literature to summarize the health effects of exposure to the 21 MSATs defined by EPA in 2001.
- Critically analyze the literature for a subset of priority MSATs.

- Identify and summarize key gaps in existing research and unresolved questions about the priority MSATs.

HEI chose to review literature for acetaldehyde; acrolein; benzene; 1,3-butadiene; formaldehyde; naphthalene; and POM. Diesel exhaust was included, but not reviewed, in this study because it had been reviewed by HEI and EPA recently. In general, the report concluded that the cancer health effects attributable to mobile sources are difficult to discern because the majority of quantitative assessments are derived from occupational cohorts with high concentration exposures and because some cancer potency estimates are derived from animal models. The report suggested that substantial improvements in analytical sensitivity and specificity of biomarkers would provide better linkages between exposure and health effects. Noncancer endpoints were not a central focus of most research and, therefore, require further investigation. Subpopulation susceptibility also requires additional evaluation. The study is available from HEI’s Web site at <pubs.healtheffects.org/view.php?id=282>.

**Kansas City PM Characterization Study (Kansas City Study)**

This study was initiated by EPA to conduct exhaust emissions testing on 480 light-duty, gasoline vehicles in the Kansas City metropolitan area. Major goals of the study included characterizing PM emissions distributions of a sample of gasoline vehicles in Kansas City, characterizing gaseous and PM toxics exhaust emissions, and characterizing the fraction of high emitters in the fleet. In the process, sampling methodologies were evaluated. Overall, results from the study were used to populate databases for the MOVES emissions model. FHWA was one of the research sponsors. This study is available on EPA’s Web site at <epa.gov/otaq/emission-factors-research/420r08009.pdf>.

**Estimating the Transportation Contribution to Particulate Matter Pollution (Air Toxics Supersite Study)**

The purpose of this study was to improve understanding of the role of highway transportation sources in PM pollution. In particular, it was important to examine uncertainties, such as the effects of the spatial and temporal distribution

of travel patterns, consequences of vehicle fleet mix and fuel type, the contribution of vehicle speed and operating characteristics, and influences of geography and weather. The fundamental methodology of the study was to combine EPA research-grade air quality monitoring data in a representative sample of metropolitan areas with traffic data collected by State departments of transportation and local governments.

Phase I of the study, the planning and data evaluation stage, assessed the characteristics of EPA’s ambient PM monitoring initiatives and recruited State departments of transportation and local governments to participate in the research. After evaluating and selecting potential metropolitan areas based on the quality of PM and traffic monitoring data, nine cities were selected to participate in Phase II. The goal of Phase II was to determine whether correlations could be observed between traffic on highway facilities and ambient PM concentrations. The Phase I report was published in September 2002. Phase II included the collection of traffic and air quality data and data analysis. Ultimately, six cities participated: New York City (Queens), Baltimore, Pittsburgh, Atlanta, Detroit, and Los Angeles.

In Phase II, air quality and traffic data were collected. The air quality data were obtained from EPA’s Aerometric Information Retrieval System Air Quality Subsystem, Supersite personnel, and North American Research Strategy for Tropospheric Ozone and Aerosols data archive site. Traffic data included intelligent transportation systems (roadway surveillance), coverage counts (routine traffic monitoring), and supplemental counts (specifically for the research project). Analyses resulted in the conclusion that only a weak correlation existed between PM<sub>2.5</sub> concentrations and traffic activity for several of the sites. The existence of general trends indicates a relationship, an assumption that, however, is primarily unquantifiable. Limitations of the study include the assumption that traffic sources are close enough to ambient monitors to provide sufficiently strong source strength, the assumption that vehicle activity is an appropriate surrogate for mobile emissions, and the lack of knowledge of other factors such as nontraffic sources of PM and its precursors. A paper documenting the work of Phase II was presented at the



2004 Emissions Inventory Conference and is available at <epa.gov/ttn/chief/conference/ei13/mobile/black.pdf>.

## Mitigation

Construction air quality impacts of the proposed action would be limited to short-term increased fugitive dust and mobile source emissions. Fugitive dust would be generated by haul trucks, concrete trucks, delivery trucks, and other earthmoving vehicles operating around the construction sites. Increased dust levels would be attributable primarily to PM resuspended by vehicle movement over paved and unpaved roads and other surfaces, dirt tracked onto paved surfaces from unpaved areas at access points, and material blown from uncovered haul trucks.

Generally, the distance that particles drift from their source depends on size, height at which the emission occurs, and wind speed. Small particles (30 to 100 micron range) can travel more than 30 feet before settling to the ground, depending on wind speed. Most fugitive dust, however, is made up of relatively large particles (i.e., greater than 100 microns in diameter). These particles are responsible for the reduced visibility often associated with this type of construction. Given their relatively large size, these particles tend to settle within 20 to 30 feet of their source.

CO is the pollutant of concern when considering localized air quality impacts of motor vehicles. Because CO emissions factors increase with slower vehicle speeds below 35 miles per hour (mph), disruption of traffic during construction could result in short-term elevated concentrations of CO because of the temporary reduction of road capacity and increased queue lengths. To minimize emissions, efforts would be made during the construction phase to limit disruption to traffic, especially during peak travel periods.

To reduce the amount of construction dust generated, particulate control measures related to construction activities must be followed. The following mitigation measures would be followed, when applicable, in accordance with the most recently accepted version of the ADOT *Standard Specifications for Road and Bridge Construction* (2008).

- Site preparation
  - Minimize land disturbance.
  - Use watering trucks to minimize dust.
  - Stabilize the surface of dirt piles if not removed immediately.
  - Use windbreaks to prevent accidental dust pollution.
  - Limit vehicular paths and stabilize temporary roads.
  - To prevent dirt from being tracked or washed onto paved roads, 50-foot-long track-out pads consisting of 12-inch-deep aggregate, 3 to 6 inches in diameter, would be placed over geotextile fabric adjacent to paved roads.
- Construction
  - Use dust suppressants on unpaved traveled paths.
  - Minimize unnecessary vehicular and machinery activities.
  - To prevent dirt from being tracked or washed onto paved roads, 50-foot-long track-out pads consisting of 12-inch-deep aggregate, 3 to 6 inches in diameter, would be placed over geotextile fabric adjacent to paved roads.
  - To the extent practicable, construction equipment that meets EPA's Tier 4 non-road emission standards shall be used.
  - Where feasible, construction equipment powered by alternative fuels (e.g., biodiesel, compressed natural gas, electricity) shall be used.
  - ADOT would provide training to contractor's personnel regarding air quality impacts from construction activities, potential health risks to nearby receptors, and methods to reduce emissions.
- Postconstruction
  - Revegetate or use decomposed granite on all disturbed land (see section, *Mitigation*, beginning on page 4-138, regarding applicable measures to reduce impacts on biological resources).
  - Remove dirt piles and unused materials.
  - Revegetate all vehicular paths created during construction to avoid future off-road vehicular activities.

A traffic control plan would be developed and implemented to help reduce impacts of traffic congestion and associated emissions during construction. Prior to construction and in accordance with Maricopa County Rule 310, Fugitive Dust Ordinance, the contractor shall obtain an approved dust permit from MCAQD for all phases of the proposed action. The permit would describe measures to control and regulate air pollutant emissions during construction (see Appendix 4-4).

## Greenhouse Gas Emissions (Climate Change)

Climate change is an important national and global concern. While the earth has gone through many natural changes in climate in its history, there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) GHG emissions contribute to this rapid change. Carbon dioxide (CO<sub>2</sub>) makes up the largest component of these GHG emissions. Other prominent transportation-related GHGs include methane and nitrous oxide.

Many GHGs occur naturally. Water vapor is the most abundant GHG and makes up approximately two thirds of the natural greenhouse effect. However, the burning of fossil fuels and other human activities are adding to the concentration of GHGs in the atmosphere. Many GHGs remain in the atmosphere for time periods ranging from decades to centuries. GHGs trap heat in the earth's atmosphere. Because the atmospheric concentration of GHGs continues to climb, our planet will likely continue to experience climate change-related phenomena. For example, warmer global temperatures can cause changes in precipitation and sea levels.

To date, no national standards have been established regarding GHGs, nor has EPA established criteria or thresholds for ambient GHG emissions pursuant to its authority to establish motor vehicle emission standards for CO<sub>2</sub> under the CAA. However, there is a considerable body of scientific literature addressing the sources of GHG emissions and their adverse effects on climate, including reports from the Intergovernmental Panel on Climate

Change, the U.S. National Academy of Sciences, and EPA and other federal agencies. GHGs are different than other air pollutants evaluated in federal environmental reviews because their impacts are not localized or regional given their rapid dispersion into the global atmosphere, which is characteristic of these gases. The *affected environment* for CO<sub>2</sub> and other GHG emissions is the entire planet. In addition, from a quantitative perspective, global climate change is the cumulative result of numerous and varied emissions sources (in terms of both absolute numbers and types), each of which makes a relatively small addition to global atmospheric GHG concentrations. In contrast to broad-scale actions such as those involving an entire industry sector or very large geographic areas, it is difficult to isolate and understand the GHG emissions’ impacts for a particular transportation project. Furthermore, presently there is no scientific methodology for attributing specific climatological changes to a particular transportation project’s emissions.

Under NEPA, detailed environmental analysis should focus on issues that are significant and meaningful to decision making [40 C.F.R. §§ 1500.1(b), 1500.2(b), 1500.4(g), and 1501.7]. FHWA has concluded, based on the nature of GHG emissions and the exceedingly small potential GHG impacts of the proposed action (as discussed below and as shown in Table 4-37), that GHG emissions from the proposed action would not result in “reasonably foreseeable significant adverse impacts on the human environment” [40 C.F.R. § 1502.22(b)]. The GHG emissions from the action alternatives would be insignificant and would not play a meaningful role in a determination of the environmentally preferable alternative or identification of the Preferred Alternative. More detailed information on GHG emissions is not “essential to a reasoned choice among reasonable alternatives” [40 C.F.R. § 1502.22(a)] or to making a determination in the best overall public interest based on a balanced consideration of transportation, economic, social, and environmental needs and impacts [23 C.F.R. § 771.105(b)]. For these reasons, no alternatives-level GHG analysis has been performed for this project.

The context in which the emissions from the proposed project would occur, together with the expected GHG emissions contribution from the project, illustrate why the project’s GHG emissions would not be significant and would not be a substantial factor in the alternatives screening process. The transportation sector is the second-largest source of total GHG emissions in the United States, behind electricity generation. The transportation sector was responsible for approximately 27 percent of all anthropogenic GHG emissions in the United States in 2009.<sup>27</sup> The majority of transportation-related GHG emissions result from fossil fuel combustion. CO<sub>2</sub> makes up the largest component of these GHG emissions. U.S. CO<sub>2</sub> emissions from the consumption of energy accounted for about 18 percent of worldwide energy consumption CO<sub>2</sub> emissions in 2009.<sup>28</sup> U.S. transportation CO<sub>2</sub> emissions accounted for about 6 percent of worldwide CO<sub>2</sub> emissions.<sup>29</sup>

While the contribution of GHGs from transportation in the United States as a whole is a large component of U.S. GHG emissions, as the scale of analysis is reduced the GHG contributions become quite small. Using CO<sub>2</sub>

because of its predominant role in GHG emissions, Table 4-37 presents the relationship between current and projected Arizona highway CO<sub>2</sub> emissions and total global CO<sub>2</sub> emissions, as well as information on the scale of the project relative to statewide travel activity.

Based on emissions estimates from EPA’s MOVES model<sup>30</sup> and on global CO<sub>2</sub> estimates and projections from the U.S. Energy Information Administration, CO<sub>2</sub> emissions from motor vehicles in the entire state of Arizona contributed less than one tenth of 1 percent of global emissions in 2012 (0.0932 percent) and are projected to contribute an even smaller fraction (0.0856 percent) in 2035.<sup>31</sup> VMT in the project study area represent slightly less than 15 percent of total Arizona travel activity; the proposed project itself would increase statewide VMT by less than 1 percent. (Note that the project study area, as defined for the MSAT analysis, covers the entire southwestern portion of the Phoenix metropolitan area and, thus, includes travel on many other roadways in addition to the proposed action.) As a result, FHWA estimates that the Preferred Alternative could result in an increase in global CO<sub>2</sub> emissions in 2035 of 0.00017 percent (less than one thousandth of 1 percent) and a corresponding increase in Arizona’s share of global emissions in 2035 to 0.0858 percent. This very small change in global emissions is well within the range of uncertainty associated with future emissions estimates.<sup>32,33</sup>

Mitigation for Global Greenhouse Gas Emissions

To help address the global issue of climate change, USDOT is committed to reducing GHG emissions from vehicles traveling on our nation’s highways. USDOT and EPA are working together to reduce these emissions by substantially improving vehicle efficiency and shifting toward lower carbon-intensive fuels. The agencies have jointly established new, more stringent fuel economy and first-ever GHG emissions standards for model year 2012 to 2025 cars and light trucks, with an ultimate fuel economy standard of 54.5 miles per gallon for cars and light trucks by model year 2025. Further, on September 15, 2011, the agencies jointly published the first-ever fuel economy and GHG emissions standards for heavy-duty trucks and buses.<sup>34</sup> Increasing use of technological innovations that can improve fuel economy, such as gasoline- and diesel-electric

Table 4-37 Statewide and Project Greenhouse Gas Emissions Potential, Relative to Global Totals

| Time Frame               | Global CO <sub>2</sub> <sup>a</sup> Emissions, (million metric tons) <sup>b</sup> | Arizona Motor Vehicle CO <sub>2</sub> Emissions (million metric tons) <sup>c</sup> | Arizona Motor Vehicle Emissions, Percentage of Global Total | Project Study Area VMT <sup>d</sup> Percentage of Statewide VMT | Percentage Change in Statewide VMT Attributable to Project |
|--------------------------|---|--|---|---|--|
| 2012                     | 32,300  | 30.1   | 0.0932  | 13.1  | Not applicable   |
| Future Conditions (2035) | 43,700  | 37.4   | 0.0858  | 12.8  | 0.198  |

Notes: Global emissions estimates are from the U.S. Energy Information Administration’s *International Energy Outlook 2013*, data for Figure 140. Arizona emissions and statewide vehicle miles traveled (VMT) estimates are from the U.S. Environmental Protection Agency’s MOVES model (2010). Project study area VMT data come from information compiled for the mobile source air toxics analysis documented in the air quality technical report; estimates reflect the Preferred Alternative (see sidebar on page 4-2 for information on how to review the report).

<sup>a</sup> carbon dioxide

<sup>b</sup> Estimates are from the U.S. Energy Information Administration’s *International Energy Outlook 2013* and are considered the best available projections of emissions from fossil fuel combustion. These totals do not include other sources of emissions such as cement production, deforestation, or natural sources; reliable future projections for such emissions sources are not available.

<sup>c</sup> The U.S. Environmental Protection Agency’s MOVES model projections suggest that Arizona motor vehicle CO<sub>2</sub> emissions may increase by 24 percent between 2012 and 2035. The 2010 Arizona statewide transportation planning framework (bqaz.org) predicts that statewide VMT will increase by 133 percent between 2005 and 2035; the increase in emissions is smaller than the increase in VMT because improved fuel economy in the vehicle fleet (as characterized in the model) would help offset much of the emissions increase that would otherwise occur.

<sup>d</sup> vehicle miles traveled



hybrid vehicles, will improve air quality and reduce CO<sub>2</sub> emissions in future years.

Consistent with its view that broad-scale efforts hold the greatest promise for meaningfully addressing the global climate change problem, FHWA is engaged in developing strategies to reduce transportation's contribution to GHGs—particularly CO<sub>2</sub> emissions—and to assess the risks to transportation systems and services from climate change. In an effort to assist States and metropolitan planning organizations in performing GHG analyses, FHWA has developed a *Handbook for Estimating Transportation GHG Emissions for Integration into the Planning Process*. The handbook presents methodologies reflecting good practices for the evaluation of GHG emissions at the transportation program level, and demonstrates how such an evaluation may be integrated into the transportation planning process. FHWA has also developed a tool for use at the statewide level to model a large number of GHG reduction scenarios and alternatives for use in transportation planning, climate action plans, scenario planning exercises, and in meeting state GHG reduction targets and goals. To assist states and metropolitan planning organizations in assessing the climate change vulnerabilities of their transportation networks, FHWA has developed a draft vulnerability and risk assessment conceptual model and has piloted the model in several locations.

### Summary of Greenhouse Gas Discussion

This document does not incorporate an analysis of the GHG emissions or climate change effects of each of the action alternatives because the potential change in GHG emissions is very small in the context of the affected environment. Because of the insignificance of the GHG impacts, those impacts will not be meaningful to identification of the Preferred Alternative. As outlined above, FHWA is working to develop strategies to reduce transportation's contribution to GHGs—particularly CO<sub>2</sub> emissions—and to assess the risks to transportation systems and services from climate change. FHWA will continue to pursue these efforts as productive steps to address this important issue. Finally, the construction best practices described above represent practicable project-level measures that, while not substantially reducing global

GHG emissions, may help reduce GHG emissions on an incremental basis and could contribute in the long term to meaningful cumulative reduction when considered across the Federal-aid highway program.

## CONCLUSIONS

Since O<sub>3</sub> is a regional pollutant, there is no requirement to analyze potential impacts and no possibility of localized violations of O<sub>3</sub> occurring at the project level. The CO and PM<sub>10</sub> hot-spot analyses described above demonstrate that the proposed project would not contribute to any new local violations, increase the frequency or severity of any existing violation, or delay timely attainment of the NAAQS or any required interim emissions reductions or other milestones.

The project is included in MAG's fiscal year 2014–2018 TIP and the 2035 RTP, which were found to conform to the O<sub>3</sub>, CO, and PM<sub>10</sub> SIP by USDOT on February 12, 2014. The project is identified in these documents using several different project identification numbers by construction segment (47518, 43086, 43087, 11305, 15671, 19029, 17193, 6458, 1790, 6919, and 47857). The design concept and scope of the Preferred Alternative are consistent with that used in the regional emissions analysis for the RTP and TIP conformity determinations.

Therefore, based on the CO and PM<sub>10</sub> analyses conducted for the Preferred Alternative, the proposed project would not contribute to any new local violations, increase the frequency or severity of any existing violation, or delay timely attainment of the NAAQS or any required interim emissions reductions or other milestones. The project complies with the transportation conformity regulations at 40 C.F.R. Part 93 and with the conformity provisions of Section 176(c) of the CAA.

Total exposure to MSAT pollutants is a function of exposures near roadways, exposures at other locations visited during the day, exposures incurred as part of traveling on roadways, and exposures from indoor air. Because of this complexity, along with uncertainties associated with the emissions and dispersion models, it is not possible to reasonably characterize the health impacts

of the projected action/No-Action emission increases (or decreases) in any particular location. Within these uncertainties, the quantitative analysis performed for the proposed action determined that the Preferred Alternative would likely result in a reduction of total MSATs emissions in the Study Area. Some subareas would likely experience an increase in emissions relative to the No-Action Alternative, while other areas would experience a decrease. In areas where emissions are expected to increase, this would be expected to contribute to increased exposure to MSATs emissions relative to the No-Action Alternative, while the reduced emissions in the Study Area as a whole would be expected to contribute to reduced exposure. Because overall emissions would be lower than 2012 levels, it is reasonable to infer that overall health risk would also be lower than 2012 levels. Because of limitations in the methodologies of forecasting the health impacts described, any predicted difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against project benefits, such as reducing traffic congestion, that are better suited for quantitative analysis.

These limitations notwithstanding, it is important to note that existing and proposed air pollution regulations are predicted to result in dramatic nationwide reductions in MSATs by the design year (2035). The specific analyses conducted for this project also show that emissions will decline, and that reductions on the order of 57 to 92 percent will occur irrespective of whether the proposed action is constructed. Congestion relief as a result of the proposed action would provide localized reductions on arterial streets and at interchanges, and reduced travel times would result in lower exposure to the elevated concentrations of MSATs occurring in traffic.

What is noise?

Noise is unwanted or excessive sound. In many ways, under this definition, noise is undesirable but it is, by fact, a real by-product of today’s way of life. Noise can be intrusive and annoying. It can interfere with sleep, work, or recreation. Noise, in today’s society, comes from many sources; a vacuum cleaner, for example, can be disruptive to a family member who is trying to read a book. But it is recognized that transportation noise is perhaps the most pervasive and difficult source to avoid in society today. Noise from airplanes flying overhead, from trains passing by, from motorized boats on a lake, and from cars and trucks traveling on the nation’s roads and highways has become a daily part of our lives. And of these, highway traffic noise is admittedly a major contributor to overall transportation noise.

Therefore, the construction and operation of a freeway of the magnitude of a project like the proposed action would introduce a major noise source into locations where such noise may not have existed in the past. Therefore, a project like the proposed freeway could cause great concern to those who live and work near such a project. It could pass by residences, schools, parks, churches, and myriad land uses that would be particularly sensitive to the noise generated by such a project. The project team, using federal and State guidance, analyzed how a project like the proposed action would increase noise levels to adjacent areas and, for those areas that would warrant protection from the expected noise, proposed ways for ADOT and FHWA to reduce the noise to acceptable levels.

Noise mitigation strategies typically consist of placing a noise barrier, such as a concrete or masonry wall or an earth berm (or a combination of the two), along the main line or at the R/W line of a transportation corridor. Noise barriers are usually the most feasible and cost-effective strategy for mitigating highway transportation noise impacts.

NOISE

NOISE CRITERIA

The basic unit of measurement for noise is the decibel, which is a logarithmic unit that expresses the ratio of the sound pressure level being measured to a standard reference level. Environmental noise is typically frequency-weighted using the A-scale (dBA) to approximate the frequency response of the human ear. Noise analyses for transportation projects use the hourly equivalent sound level ( $L_{Aeq1h}$ , or simply  $L_{eq}$ ), which is a logarithmic energy average over a 1-hour period.

Under 23 C.F.R. § 772, FHWA is required to identify noise-sensitive land uses near its projects, to evaluate the noise impacts on those land uses, and to consider noise abatement options (see Table 4-38). To further clarify the process of noise analysis and the evaluation of noise

abatement, ADOT adopted a Noise Abatement Policy (NAP), last updated in 2011. This policy was formally approved by FHWA.

Federal regulations specify NAC for various types of land use activity categories, summarized in Table 4-38, and state that noise abatement must be considered when the predicted future peak hour traffic noise from a project would approach or exceed the NAC. The NAP defines “approach” as being within 3 dBA of the federal NAC for activity categories A, B, C, D, and E. For example, the NAP requires noise abatement considerations when the predicted future peak-hour traffic noise at Category B and C land uses is 64  $L_{eq}$  (i.e., within 3 dBA of 67  $L_{eq}$ ). Additionally, mitigation must be considered for residential properties if predicted

traffic noise levels substantially exceed existing levels. “Substantially exceed” is defined in the NAP as 15 dBA.

Part of the noise abatement consideration process specifies that the abatement must be reasonable and feasible. Feasibility evaluations consist of various constructibility issues and assessments of whether the proposed noise abatement could provide substantial noise reduction. Reasonability criteria consist of cost-benefit considerations, maximum barrier heights, and other barrier design issues.

EXISTING NOISE LEVELS

Ambient or existing noise level readings were taken at 44 locations in the Study Area. The monitoring sites, described below, were located at approximately 1-mile

Table 4-38 Federal Highway Administration Noise Abatement Criteria

| Land Use – Primary Activity Category | Activity Category $L_{Aeq1h}$ <sup>a</sup> |  | Evaluation Location | Land Use Activity Description   |
|--------------------------------------|--|--|---------------------|---|
|                                      | FHWA <sup>b</sup> Noise Abatement Criteria | ADOT <sup>c</sup> Noise Abatement Criteria |                     |   |
| A                                    | 57   | 54   | Exterior            | Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where preserving those qualities is essential if the area is to continue to serve its intended purpose   |
| B <sup>d</sup>                       | 67   | 64   | Exterior            | Residential   |
| C <sup>d</sup>                       | 67   | 64   | Exterior            | Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings |
| D                                    | 52   | 49   | Interior            | Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios   |
| E <sup>d</sup>                       | 72   | 69   | Exterior            | Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in category A–D or F   |
| F                                    | — <sup>e</sup>                             | —  | —                   | Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities, water resources, water treatment, electrical, and warehousing  |
| G                                    | —  | —  | —                   | Undeveloped lands that are not permitted  |

<sup>a</sup> The  $L_{Aeq1h}$  activity category values are for impact determination only and are not design standards for noise abatement measures.  
<sup>b</sup> Federal Highway Administration   <sup>c</sup> Arizona Department of Transportation   <sup>d</sup> includes undeveloped lands permitted for this activity category   <sup>e</sup> not applicable

Source: 23 Code of Federal Regulations § 772



spacings along the corridor. Receiver locations are shown on Figures 4-26 through 4-29.

The existing noise levels were recorded at the monitoring sites with Larson Davis Model 812 and Model 820 Type I integrating sound level meters. The readings were taken on numerous occasions from September 2003 to July 2004 during nonpeak traffic conditions.

Weather conditions during the readings ranged from clear skies to mostly cloudy skies, 58° to 103° Fahrenheit and 8 to 35 percent relative humidity, with breezes averaging 0 mph to 5.9 mph from variable directions. Such weather conditions are within the parameters established by FHWA in *Measurement of Highway-Related Noise* (FHWA 1996) and have little effect on the transmission of sound energy for the receivers in the Study Area.

Each monitoring period consisted of a 15- to 30-minute sound level recording using an integrating sound level meter. Most readings were conducted for a period of 15 minutes. Based on FHWA guidance, the longer monitoring periods were used at locations with little traffic noise and greater short-term variations in ambient noise. The duration of each reading was sufficient to record the existing noise characteristics at the monitoring location. At all locations, the meter was placed approximately 5 feet above the ground. Results of the ambient noise monitoring are shown in Table 4-39.

## ENVIRONMENTAL CONSEQUENCES

For the three Western Section action alternatives and options and the Eastern Section action alternative, over 220 sensitive receivers were evaluated from a traffic noise perspective. Receiver locations for the Western Section of the Study Area are indicated on Figures 4-26 through 4-28. Receiver locations for the Eastern Section of the Study Area are indicated on Figure 4-29. The impacts from each of the action alternatives and options and those of the No Action Alternative are discussed in more detail later in this section.

In areas where the Western Section action alternatives are located close together, nearby receivers were evaluated

for both action alternatives and are listed in Table 4-40 under both alternatives. Also, several new residential subdivisions have been developed since the initial noise evaluations began in 2003. To include these new receiver locations without altering the sequential numbering system, additional receivers were assigned an identification beginning with the nearest receiver number, followed by a letter to distinguish the new receiver. For instance, if the nearest existing receiver was numbered 26, the additional nearby receiver was numbered 26a.

The receivers were evaluated using the future year (2035) peak-hour traffic volumes. Noise levels with and without mitigation were modeled, and the results of the noise analysis for each receiver are summarized in Table 4-40. For some of the receivers, noise from nearby cross-street traffic limited the amount of noise reduction that could be achieved for the proposed action. Mitigation is discussed in further detail in the next section.

## Action Alternatives, Western Section

The evaluation of impacts on noise-sensitive receivers included modeling noise level impacts from the W59 Alternative, W71 Alternative, and W101 Alternative and Options along I-10 (Papago Freeway) near and including where the new system traffic interchange would connect I-10 and the proposed action. The receivers for this analysis can be found in Table 4-40 and are denoted by the prefix “I-10” in the first column. Because the W101 Alternative and its Options would result in the same impacts along I-10, the results are presented only for the Western Option.

### W59 (Preferred) Alternative

Projected peak-hour noise levels along the W59 Alternative and I-10 (Papago Freeway) ranged from 61 dBA  $L_{eq}$  to 78 dBA  $L_{eq}$  at the 84 receivers. The predicted noise levels at 72 of the 84 receivers would approach or exceed the ADOT mitigation criterion and would be eligible for consideration of noise abatement. Twenty of the affected receivers are predicted to experience “substantial increases” of 15 dBA or more over existing noise levels in the 2035 peak noise hour.

Fifty-three of the affected receivers are located in census blocks or census block groups with environmental justice populations.

### W71 Alternative

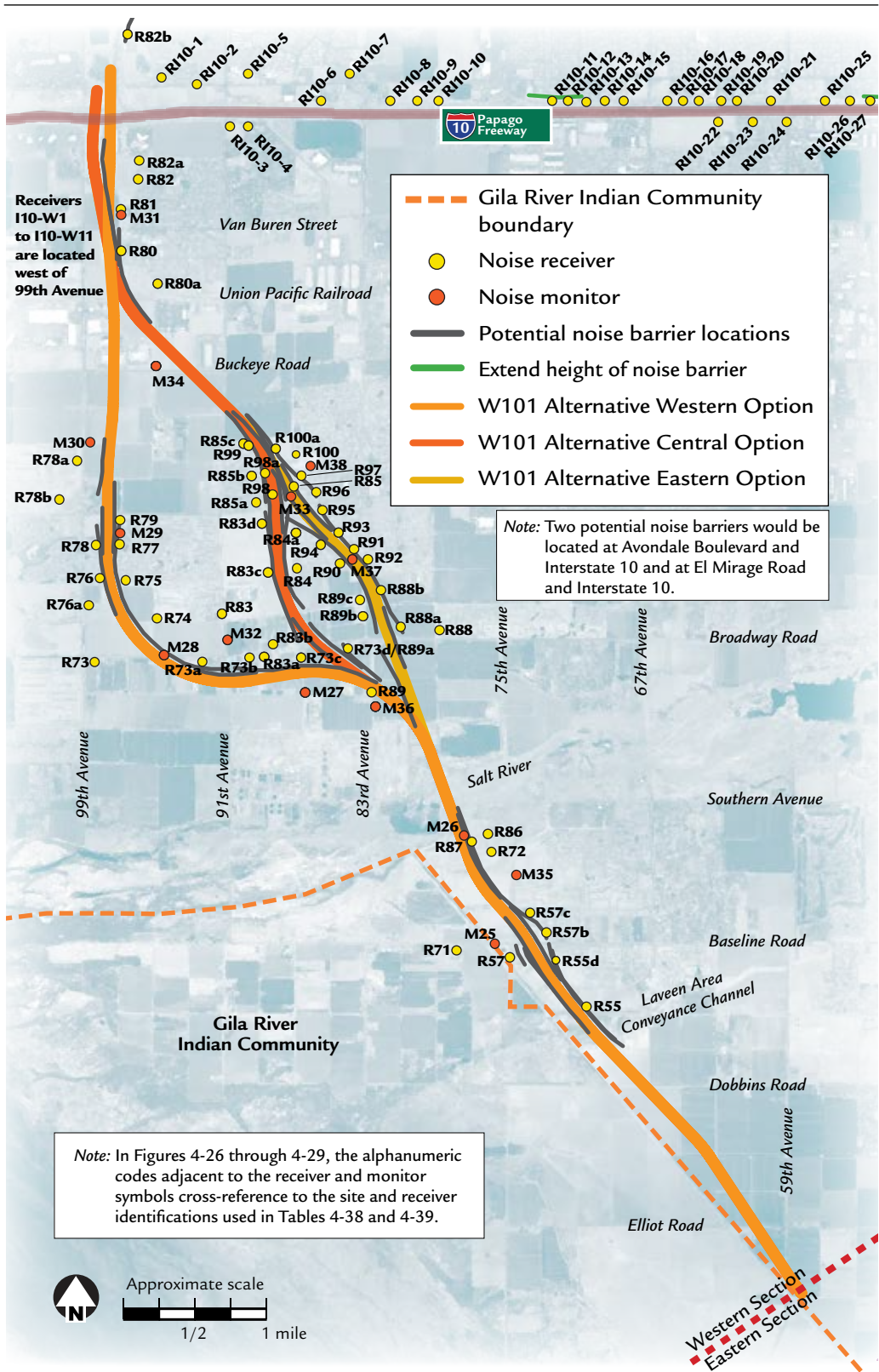
Projected peak-hour noise levels along the W71 Alternative and I-10 ranged from 60 dBA  $L_{eq}$  to 76 dBA  $L_{eq}$  at the 80 receivers. The projected noise levels at 67 of the 80 receivers would approach or exceed the ADOT mitigation criterion. Thirty of the affected receivers are predicted to experience “substantial increases” of 15 dBA or more over existing noise levels in the 2035 peak noise hour. Most of the 67 affected receivers along this action alternative and I-10 would be eligible for consideration of noise abatement, with the exception of one motel that does not have outdoor use areas and thus would not be considered for mitigation. Sixty-one of the affected receivers are located in census blocks or census block groups with environmental justice populations.

### W101 Alternative and Options

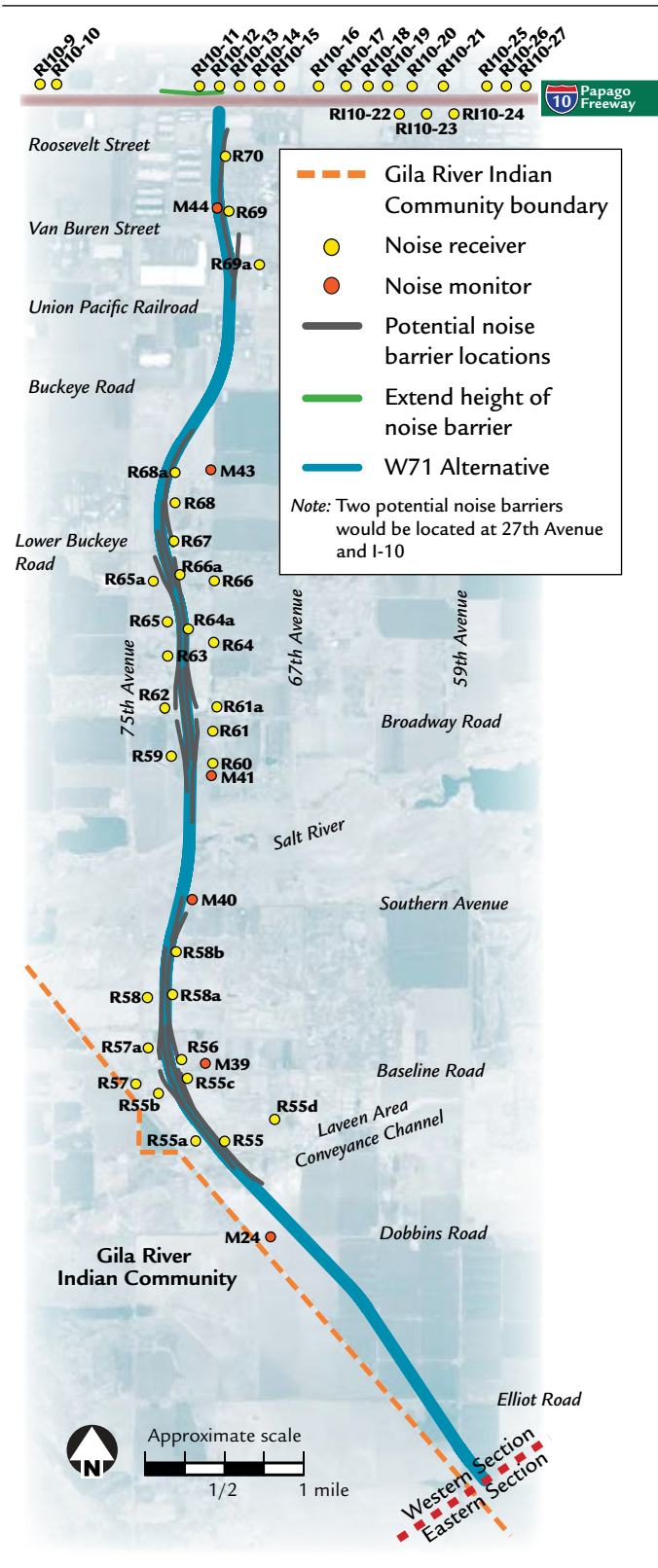
- Projected peak-hour noise levels along the W101 Alternative Western Option ranged from 61 dBA  $L_{eq}$  to 75 dBA  $L_{eq}$  at the 29 receivers. The projected noise levels at 26 of the 29 receivers would approach or exceed the ADOT mitigation criterion. Seven of the affected receivers are predicted to experience “substantial increases” of 15 dBA or more over existing noise levels in the 2035 peak noise hour. The 26 affected receivers along this option would be eligible for consideration of noise abatement. Twenty-four of the affected receivers are located in census blocks or census block groups with environmental justice populations.
- Projected peak-hour noise levels along the W101 Alternative Central Option ranged from 60 dBA  $L_{eq}$  to 75 dBA  $L_{eq}$  at the 14 receivers. The projected noise levels at 11 of the 14 receivers would approach or exceed the ADOT mitigation criterion. Four of the affected receivers are predicted to experience “substantial increases” of 15 dBA or more over existing noise levels in the 2035



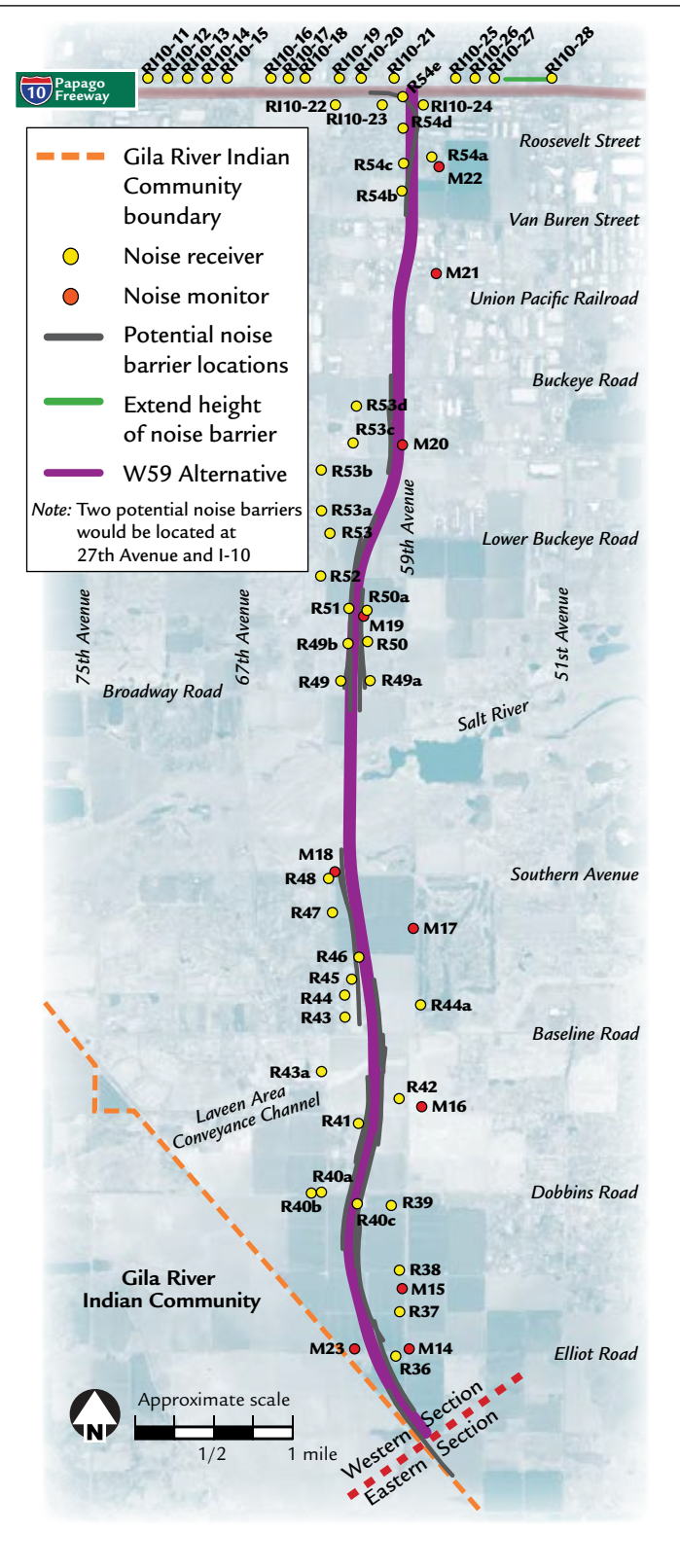
**Figure 4-26** Noise Receiver and Potential Barrier Locations, W101 Alternative and Options



**Figure 4-27** Noise Receiver and Potential Barrier Locations, W71 Alternative



**Figure 4-28** Noise Receiver and Potential Barrier Locations, W59 Alternative



Noise receivers were modeled adjacent to known noise-sensitive locations along the action alternatives' alignments in the Western Section. Locations and/or extent of barriers could change. Exact noise barrier locations and dimensions would be determined during the design phase. The public would continue to be engaged in freeway-related noise issues through construction and operation of the proposed action (see Figure 4-30, on page 4-100).



peak noise hour. The 11 affected receivers along this option would be eligible for consideration of noise abatement. Ten of the affected receivers are located in census blocks or census block groups with environmental justice populations.

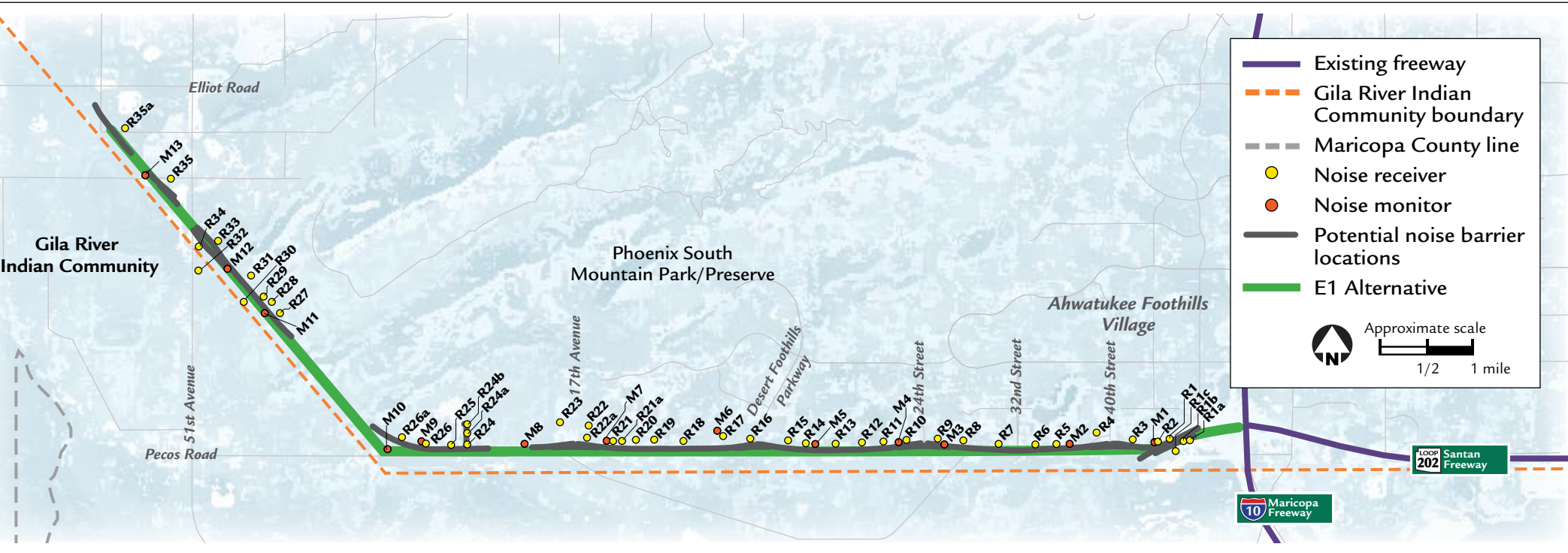
- Projected peak-hour noise levels along the W101 Alternative Eastern Option ranged from 62 dBA  $L_{eq}$  to 74 dBA  $L_{eq}$  at the 26 receivers. The projected noise levels at 25 of the 26 receivers would approach or exceed the ADOT mitigation criterion. Twenty-one of the affected receivers are predicted to experience “substantial increases” of 15 dBA or more over existing noise levels in the 2035 peak noise hour. The 25 affected receivers along this option would be eligible for consideration of noise abatement. Eighteen of the affected receivers are located in census blocks or census block groups with environmental justice populations.
- Projected peak-hour noise levels along I-10 (Papago Freeway) for the W101 Alternative and Options ranged from 60 dBA  $L_{eq}$  to 71 dBA  $L_{eq}$  at the 35 receivers. The projected noise levels at 12 of the 35 receivers would approach or exceed the ADOT mitigation criterion. Three of the affected receivers are predicted to experience “substantial increases” of 15 dBA or more over existing noise levels in the 2035 peak noise hour. The 12 affected receivers along I-10 would be eligible for consideration of noise abatement.

**Action Alternative, Eastern Section**  
**E1 (Preferred) Alternative**

Most of the 44 receivers are located along the existing Pecos Road; the remainder of the receivers are located between 43rd and 55th avenues.

Projected peak-hour noise levels along the E1 Alternative ranged from 63 dBA  $L_{eq}$  to 77 dBA  $L_{eq}$  at the 44 receivers. The projected noise level at 42 of the 44 receivers would exceed the ADOT mitigation criterion. Forty-one of the affected receivers are predicted to experience “substantial increases” of 15 dBA or more over existing noise levels in the 2035 peak noise hour. Most of the 42 affected receivers

**Figure 4-29** Noise Receiver and Potential Barrier Locations, Eastern Section



Noise receivers were modeled adjacent to known noise-sensitive locations along the E1 Alternative in the Eastern Section. Locations and/or extent of barriers could change. Exact noise barrier locations and dimensions would be determined during the design phase. The public would be encouraged to continue to be engaged in freeway-related noise issues through construction and operation of the proposed action (see Figure 4-30, on page 4-100).

along this action alternative (including one on Community land [Receiver 34]) would be eligible for consideration of noise abatement. The Vee Quiva Casino, represented by Receiver 30, does not have outdoor use areas and thus would not be considered for mitigation. Thirteen of the affected receivers are in census blocks or census block groups with environmental justice populations.

**No-Action Alternative**

Noise impacts from the No-Action Alternative would be caused by vehicle traffic along arterial and other area surface streets. Based on projected growth throughout the region, traffic congestion would increase under this alternative, which would reduce travel speeds and thereby reduce traffic noise levels. As such, the No Action Alternative would generally result in lower noise levels at the selected receivers than would any of the action alternatives, but would result in higher noise levels at other locations, such as along arterial streets.

Noise from this alternative would be generated by traffic on neighborhood and arterial streets, as well as by nontraffic noise sources and other general neighborhood activity. Therefore, it is difficult to quantify the projected noise levels from the No-Action Alternative.

**MITIGATION**  
**ADOT Environmental Planning Group and Design Responsibilities**

Noise mitigation was evaluated for receivers where predicted 2035 peak noise levels approach or exceed the appropriate activity category NAC, or where 2035 peak noise levels substantially exceed existing levels. Noise mitigation, in the form of noise walls or earth berms, is discussed for each of the action alternatives and options. Noise walls and earth berms are the most common type of noise mitigation used along ADOT freeways. Noise barrier locations for the Western and Eastern Sections are shown in Figures 4-26 through 4-29. Other noise

**Are the noise barriers shown in the FEIS the exact locations?**

The noise analysis was based on preliminary design and traffic information. Numerous “state-of-the-practice” assumptions were made to complete the noise analysis. As the design of the proposed action further develops, additional noise analyses would be conducted. The results of this analysis and the mitigation recommendations should not be considered final and would need to be verified and refined as the design would progress.

Table 4-39 Ambient Noise Monitoring Results, Western and Eastern Sections

| Site Identification | Alternative/Alignment Option     | Location Description  | Ambient Noise Level (L <sub>Aeq1h</sub> ) <sup>a</sup> |
|---------------------|----------------------------------|---|--|
| Western Section     |                                  |   |  |
| M14 <sup>b</sup>    | W101, W71, W59                   | Corner of 59th Avenue and Elliot Road                                 | 49   |
| M15                 | W59                              | 59th Avenue, 3/8 mile north of Elliot Road                            | 45   |
| M16                 | W59                              | South Mountain Avenue, west of 59th Avenue                            | 47   |
| M17                 | W59                              | Corner of 59th Avenue and Vineyard Road                               | 50   |
| M18                 | W59                              | Southern Avenue, 1/2 mile west of 59th Avenue                         | 58   |
| M19                 | W59                              | Corner of 61st Avenue and Warner Street                               | 51   |
| M20                 | W59                              | 59th Avenue and Roosevelt Irrigation District canal                   | 64   |
| M21                 | W59                              | 57th Drive south of Jefferson Street                                  | 58   |
| M22                 | W59                              | Southwest Village Apartments, 777 North 59th Avenue, southeast corner | 49   |
| M23                 | W101, W71, W59                   | Elliot Road at Community <sup>c</sup> boundary                        | 49   |
| M24                 | W101, W71                        | Dobbins Road at Community boundary                                    | 54   |
| M25                 | W101 Western Option              | Baseline Road at Community boundary                                   | 61   |
| M26                 | W101 Western and Central Options | Alta Vista Road, west of 75th Avenue                                  | 50   |
| M27                 | W101 Western and Central Options | 87th Avenue, 1/4 mile south of Broadway Road                          | 52   |
| M28                 | W101 Western Option              | Broadway Road, 1/2 mile west of 91st Avenue                           | 62   |
| M29                 | W101 Western Option              | Kingman Street, east of 97th Avenue                                   | 48   |
| M30                 | W101 Western Option              | 99th Avenue, 1/2 mile north of Lower Buckeye Road                     | 57   |
| M31                 | W101 Central Option              | Apartments on 96th Avenue, north of Van Buren Street                  | 50   |
| M32                 | W101 Central Option              | 91st Avenue, 500 feet north of Broadway Road                          | 62   |
| M33                 | W101 Central Option              | 87th Avenue, north of Lower Buckeye Road                              | 53   |
| M34                 | W101 Central and Eastern Options | Buckeye Road, 1/2 mile east of 99th Avenue                            | 59   |

| Site Identification | Alternative/Alignment Option | Location Description                                       | Ambient Noise Level (L <sub>Aeq1h</sub> ) <sup>a</sup> |
|---------------------|------------------------------|--|--|
| M35                 | W101 Eastern Option          | 75th Avenue, 1/2 mile south of Southern Avenue             | 49   |
| M36                 | W101 Eastern Option          | 83rd Avenue, 3/4 mile south of Broadway Road               | 53   |
| M37                 | W101 Eastern Option          | Elwood Street, west of 83rd Avenue                         | 53   |
| M38                 | W101 Eastern Option          | Watkins Street, east of 86th Drive                         | 54   |
| M39                 | W71                          | Baseline Road, east of 75th Avenue                         | 63   |
| M40                 | W71                          | Southern Avenue, east of 75th Avenue                       | 62   |
| M41                 | W71                          | 71st Avenue, south of Wier Avenue                          | 44   |
| M42                 | W71                          | Crown King Road, east of 73rd Drive                        | 54   |
| M43                 | W71                          | Durango Street, west of 71st Avenue                        | 48   |
| M44                 | W71                          | Corner of 71st Avenue and Polk Street                      | 55   |
| Eastern Section     |                              |  |  |
| M1                  | E1                           | Near 44th Street and Cedarwood Lane                        | 55   |
| M2                  | E1                           | Near 36th Place and Windsong Drive                         | 52   |
| M3                  | E1                           | End of 26th Street, south of Redwood Lane                  | 56   |
| M4                  | E1                           | Apartments at 21st Street and Liberty Lane, southwest side | 53   |
| M5                  | E1                           | Church near 15th Street and Liberty Lane                   | 54   |
| M6                  | E1                           | Near Ashurst Drive and 2nd Place                           | 45   |
| M7                  | E1                           | Near 15th Avenue and Liberty Lane                          | 44   |
| M8                  | E1                           | North of Pecos Road, between 17th and 27th avenues         | 46   |
| M9                  | E1                           | Corner of 30th Lane and Redwood Lane                       | 51   |
| M10                 | E1                           | Far west end of Pecos Road at Community boundary           | 45   |
| M11                 | E1                           | Corner of 45th Avenue and Galveston                        | 48   |
| M12                 | E1                           | Corner of Dusty Lane and Ray Road                          | 54   |
| M13                 | E1                           | Estrella Drive at Community boundary                       | 55   |

<sup>a</sup> L<sub>Aeq1h</sub>, 1-hour equivalent sound level; logarithmic energy average over a 1-hour period (measured in dBA, a logarithmic unit that expresses the ratio of the sound pressure level being measured to a standard reference level and is frequency-weighted using the A-scale, to approximate the frequency response of the human ear)

<sup>b</sup> Sites M1 to M13 are located in the Eastern Section and are presented later in the table.

<sup>c</sup> Gila River Indian Community



Table 4-40 Noise Analysis Results, Western and Eastern Sections

| Receiver ID                 | Distance and Direction from Centerline | Neighborhood or Area                  | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|-----------------------------|--|---------------------------------------|---|------------------------------------|
| Western Section             |  |                                       |   |                                    |
| W59 (Preferred) Alternative |  |                                       |   |                                    |
| 36 <sup>b</sup>             | 580 feet east                          | 59th Avenue and Elliot Road           | 69  | 64                                 |
| 37                          | 1,170 feet east                        | 59th Avenue north of Elliot Road      | 66  | 60                                 |
| 38                          | 1,500 feet east                        | 59th Avenue and Olney Avenue          | 64  | 58                                 |
| 39                          | 1,225 feet east                        | 59th Avenue and Dobbins Road          | 66  | 58                                 |
| 40a                         | 925 feet west                          | 63rd Avenue and Dobbins Road          | 67  | 60                                 |
| 40b                         | 1,220 feet west                        | 63rd Avenue and Dobbins Road          | 65  | 59                                 |
| 40c                         | 250 feet west                          | 61st Avenue and Dobbins Road          | 73  | 63                                 |
| 41                          | 385 feet west                          | 61st Avenue and South Mountain Avenue | 74  | 64                                 |
| 42                          | 790 feet east                          | 59th Avenue and South Mountain Avenue | 69  | 62                                 |
| 43                          | 920 feet west                          | Rancho Grande                         | 63  | 58                                 |
| 43a <sup>d</sup>            | 1,750 feet west                        | Avalon Village                        | 67  | 61                                 |
| 44                          | 835 feet west                          | Rancho Grande                         | 68  | 61                                 |
| 44a                         | 1,590 feet east                        | Cottonwood Golf Course                | 63  | 62                                 |
| 45                          | 530 feet west                          | Rancho Grande                         | 71  | 63                                 |
| 46                          | 145 feet west                          | Rancho Grande                         | 78  | 63                                 |
| 47                          | 895 feet west                          | Rancho Grande                         | 69  | 61                                 |
| 48                          | 840 feet west                          | Rancho Grande                         | 68  | 62                                 |
| 49                          | 485 feet west                          | Rio Del Rey Unit 1                    | 71  | 64 <sup>c</sup>                    |
| 49a                         | 470 feet east                          | Rio Del Rey Unit 2                    | 71  | 64 <sup>c</sup>                    |
| 49b                         | 270 feet west                          | Rio Del Rey Unit 1                    | 74  | 61                                 |
| 50                          | 375 feet east                          | Rio Del Rey Unit 2                    | 73  | 62                                 |
| 50a                         | 345 feet east                          | Rio Del Rey Unit 2                    | 75  | 64                                 |
| 51                          | 250 feet west                          | Rio Del Rey Unit 1                    | 76  | 63                                 |
| 52                          | 1,245 feet west                        | Estrella Manor                        | 66  | 58                                 |
| 53                          | 1,285 feet west                        | Meadows                               | 65  | 60                                 |
| 53a                         | 1,825 feet west                        | Park at Terralea                      | 62  | 59                                 |
| 53b                         | 2,350 feet west                        | Park at Terralea                      | 61  | 58                                 |
| 53c                         | 1,520 feet west                        | Western Valley Elementary School      | 65  | 60                                 |
| 53d                         | 1,405 feet west                        | 61st Avenue and Buckeye Road          | 65  | 60                                 |
| 54b                         | 355 feet west                          | 59th Avenue north of Van Buren Street | 72  | 67                                 |
| 54c                         | 430 feet west                          | Centura West                          | 72  | 69                                 |

Note: Footnotes are at the end of the table, page 4-97.

| Receiver ID                                    | Distance and Direction from Centerline | Neighborhood or Area                       | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|--|--|--|---|------------------------------------|
| 54d  | 700 feet west                          | Centura West                               | 71  | 69                                 |
| 54e  | 900 feet west                          | Patio Homes West                           | 71  | 70                                 |
| Interstate 10 with W59 (Preferred) Alternative |  |  |   |                                    |
| I-10-1   | 1,350 feet north                       | Sheely Farms Parcel 3                      | 63  | 63                                 |
| I-10-2   | 1,180 feet north                       | Apartments – McDowell Road and 93rd Avenue | 62  | 62                                 |
| I-10-3   | 510 feet south                         | Tolsun Farms                               | 68  | 62                                 |
| I-10-4   | 520 feet south                         | Tolsun Farms                               | 70  | 63                                 |
| I-10-5   | 1,440 feet north                       | Westpoint                                  | 62  | 62                                 |
| I-10-6   | 470 feet north                         | EconoLodge                                 | 72  | 72 <sup>f</sup>                    |
| I-10-7   | 1,440 feet north                       | Amberlea Cottages                          | 62  | 62                                 |
| I-10-8   | 460 feet north                         | Legacy Suites Apartments                   | 65  | 60                                 |
| I-10-9   | 410 feet north                         | Daravante                                  | 65  | 58                                 |
| I-10-10  | 380 feet north                         | Daravante                                  | 68  | 58                                 |
| I-10-11  | 440 feet north                         | Hampton Square Apartments                  | 64  | 63                                 |
| I-10-12  | 420 feet north                         | Hampton Square Apartments                  | 64  | 60                                 |
| I-10-13  | 390 feet north                         | Sunpointe Apartments                       | 65  | 60                                 |
| I-10-14  | 420 feet north                         | Las Gardenias Apartments                   | 66  | 61                                 |
| I-10-15  | 460 feet north                         | Las Gardenias Apartments                   | 65  | 63                                 |
| I-10-16  | 490 feet north                         | Westover Parc Condominiums                 | 63  | 60                                 |
| I-10-17  | 440 feet north                         | Apartments – McDowell Road and 85th Avenue | 63  | 60                                 |
| I-10-18  | 420 feet north                         | Apartments – McDowell Road and 84th Avenue | 63  | 61                                 |
| I-10-19  | 410 feet north                         | Apartments – McDowell Road and 83rd Avenue | 63  | 59                                 |
| I-10-20  | 400 feet north                         | Avanti Apartments                          | 65  | 59                                 |
| I-10-21  | 500 feet north                         | Avanti Apartments                          | 65  | 60                                 |
| I-10-22  | 340 feet south                         | La Terraza                                 | 66  | 62                                 |
| I-10-23  | 280 feet south                         | Patio Homes West                           | 72  | 63                                 |
| I-10-24  | 350 feet south                         | Patio Homes West                           | 66  | 63                                 |
| I-10-25  | 430 feet north                         | Apartments – McDowell Road and 57th Avenue | 67  | 62                                 |
| I-10-26  | 390 feet north                         | Apartments – McDowell Road and 56th Avenue | 69  | 61                                 |
| I-10-27  | 360 feet north                         | Hallcraft Villas West Condominiums         | 71  | 59                                 |
| I-10-28  | 380 feet north                         | Hallcraft Villas West Condominiums         | 73  | 62                                 |
| I-10-29  | 320 feet north                         | Winona Park 1                              | 69  | 60                                 |
| I-10-30  | 250 feet north                         | Winona Park 6A                             | 67  | 61                                 |

(continued on next page)

Table 4-40 Noise Analysis Results, Western and Eastern Sections (continued)

| Receiver ID     | Distance and Direction from Centerline | Neighborhood or Area             | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> | Receiver ID                        | Distance and Direction from Centerline | Neighborhood or Area                       | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|-----------------|--|----------------------------------|---|------------------------------------|------------------------------------|--|--|---|------------------------------------|
| I-10-31         | 250 feet north                         | Winona Park 6A                   | 67  | 61                                 | 59                                 | 435 feet west                          | Western Heritage Estates                   | 72  | 62                                 |
| I-10-32         | 310 feet south                         | Winona Park 2                    | 68  | 61                                 | 60                                 | 890 feet east                          | Western Heritage Estates 2                 | 68  | 61                                 |
| I-10-33         | 270 feet south                         | Deluxe Mobile Home Park          | 67  | 61                                 | 61                                 | 930 feet east                          | Western Heritage Estates 2                 | 67  | 62                                 |
| I-10-34         | 280 feet south                         | Deluxe Mobile Home Park          | 66  | 61                                 | 61a                                | 1,150 feet east                        | Sienna Vista                               | 66  | 62                                 |
| I-10-35         | 300 feet north                         | Franmar Manor                    | 68  | 61                                 | 62                                 | 495 feet west                          | Sienna Vista                               | 72  | 65 <sup>c</sup>                    |
| I-10-36         | 300 feet north                         | West View Manor                  | 72  | 61                                 | 63                                 | 290 feet west                          | Marbella                                   | 74  | 61                                 |
| I-10-37         | 310 feet north                         | West View Manor                  | 71  | 61                                 | 64                                 | 1,160 feet east                        | 71st Avenue and Elwood Street              | 66  | 59                                 |
| I-10-38         | 270 feet south                         | West Phoenix No. 4               | 67  | 61                                 | 64a                                | 345 feet east                          | Sienna Vista                               | 74  | 63                                 |
| I-10-39         | 220 feet south                         | West Phoenix No. 4               | 73  | 63                                 | 65                                 | 260 feet west                          | Suncrest at Estrella Village               | 76  | 63                                 |
| I-10-40         | 370 feet south                         | West Phoenix No. 4               | 70  | 63                                 | 65a                                | 410 feet west                          | Travertine at Estrella Village             | 72  | 60                                 |
| I-10-41         | 340 feet north                         | Westcroft Place                  | 72  | 60                                 | 66                                 | 1,440 feet east                        | Santa Marie Townsite                       | 64  | 59                                 |
| I-10-42         | 250 feet north                         | Isaac Infill                     | 72  | 62                                 | 66a                                | 445 feet east                          | Sienna Vista                               | 70  | 61                                 |
| I-10-43         | 360 feet north                         | Westcroft Place Plat 2           | 65  | 60                                 | 67                                 | 535 feet east                          | Santa Maria Elementary School              | 71  | 66 <sup>c</sup>                    |
| I-10-44         | 260 feet north                         | El Retiro Block 1 and 2          | 69  | 62                                 | 68                                 | 600 feet east                          | Valle Eldorado                             | 71  | 61                                 |
| I-10-45         | 240 feet north                         | Sharon Gardens                   | 72  | 62                                 | 68a                                | 385 feet east                          | Valle Eldorado                             | 74  | 63                                 |
| I-10-46         | 370 feet south                         | Westcroft Place Plat 2           | 67  | 62                                 | 69                                 | 460 feet east                          | Westridge Park 4                           | 70  | 66 <sup>c</sup>                    |
| I-10-47         | 220 feet south                         | Westcroft Place Plat 2           | 70  | 62                                 | 69a                                | 1,135 feet east                        | Western Acres                              | 65  | 60                                 |
| I-10-48         | 330 feet south                         | El Retiro Block 1 and 2          | 67  | 62                                 | 70                                 | 400 feet east                          | Westridge Park 2                           | 69  | 63                                 |
| I-10-49         | 280 feet south                         | North Willow Square              | 71  | 62                                 | Interstate 10 with W71 Alternative |  |  |   |                                    |
| I-10-50         | 370 feet south                         | North Willow Square              | 71  | 62                                 | I-10-1                             | 1,350 feet north                       | Sheely Farms Parcel 3                      | 61  | 61                                 |
| I-10-51         | 370 feet south                         | North Willow Square Plat 2       | 66  | 59                                 | I-10-2                             | 1,180 feet north                       | Apartments – McDowell Road and 93rd Avenue | 61  | 61                                 |
| W71 Alternative |  |                                  |   |                                    | I-10-3                             | 510 feet south                         | Tolsun Farms                               | 66  | 61                                 |
| 55              | 415 feet east                          | Laveen Meadows                   | 72  | 65 <sup>c</sup>                    | I-10-4                             | 520 feet south                         | Tolsun Farms                               | 68  | 62                                 |
| 55a             | 305 feet west                          | Laveen Meadows Parcel 3          | 74  | 66 <sup>c</sup>                    | I-10-5                             | 1,440 feet north                       | Westpoint                                  | 60  | 60                                 |
| 55b             | 450 feet west                          | Laveen Meadows Parcel 2          | 71  | 59                                 | I-10-6                             | 470 feet north                         | EconoLodge                                 | 70  | 70 <sup>f</sup>                    |
| 55c             | 590 feet east                          | Laveen Meadows Parcel 15         | 71  | 64 <sup>c</sup>                    | I-10-7                             | 1,440 feet north                       | Amberlea Cottages                          | 60  | 60                                 |
| 55d             | 2,000 feet east                        | Laveen Meadows Elementary School | 64  | 58                                 | I-10-8                             | 460 feet north                         | Legacy Suites Apartments                   | 63  | 58                                 |
| 56              | 590 feet east                          | Rancho Grande                    | 70  | 64 <sup>c</sup>                    | I-10-9                             | 410 feet north                         | Daravante                                  | 63  | 56                                 |
| 57              | 1,040 feet west                        | 75th Avenue and Baseline Road    | 66  | 63                                 | I-10-10                            | 380 feet north                         | Daravante                                  | 66  | 56                                 |
| 57a             | 400 feet west                          | Laveen Ranch                     | 72  | 62                                 | I-10-11                            | 440 feet north                         | Hampton Square Apartments                  | 66  | 60                                 |
| 58              | 410 feet west                          | 75th Avenue and Vineyard Road    | 74  | 62                                 | I-10-12                            | 420 feet north                         | Hampton Square Apartments                  | 65  | 58                                 |
| 58a             | 410 feet east                          | Laveen Farms Phase 1             | 74  | 62                                 | I-10-13                            | 390 feet north                         | Sunpointe Apartments                       | 64  | 58                                 |
| 58b             | 425 feet east                          | Laveen Farms Phase 1             | 74  | 63                                 | I-10-14                            | 420 feet north                         | Las Gardenias Apartments                   | 63  | 59                                 |

(continued on next page)



Table 4-40 Noise Analysis Results, Western and Eastern Sections (continued)

| Receiver ID | Distance and Direction from Centerline | Neighborhood or Area                       | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|-------------|--|--|---|------------------------------------|
| I-10-15     | 460 feet north                         | Las Gardenias Apartments                   | 64  | 61                                 |
| I-10-16     | 490 feet north                         | Westover Parc Condominiums                 | 63  | 58                                 |
| I-10-17     | 440 feet north                         | Apartments – McDowell Road and 85th Avenue | 62  | 58                                 |
| I-10-18     | 420 feet north                         | Apartments – McDowell Road and 84th Avenue | 61  | 59                                 |
| I-10-19     | 410 feet north                         | Apartments – McDowell Road and 83rd Avenue | 61  | 57                                 |
| I-10-20     | 400 feet north                         | Avanti Apartments                          | 63  | 57                                 |
| I-10-21     | 500 feet north                         | Avanti Apartments                          | 63  | 58                                 |
| I-10-22     | 340 feet south                         | La Terraza                                 | 64  | 60                                 |
| I-10-23     | 280 feet south                         | Patio Homes West                           | 70  | 61                                 |
| I-10-24     | 350 feet south                         | Patio Homes West                           | 64  | 61                                 |
| I-10-25     | 430 feet north                         | Apartments – McDowell Road and 57th Avenue | 65  | 61                                 |
| I-10-26     | 390 feet north                         | Apartments – McDowell Road and 56th Avenue | 68  | 60                                 |
| I-10-27     | 360 feet north                         | Hallcraft Villas West Condominiums         | 72  | 60                                 |
| I-10-28     | 380 feet north                         | Hallcraft Villas West Condominiums         | 72  | 61                                 |
| I-10-29     | 320 feet north                         | Winona Park 1                              | 69  | 60                                 |
| I-10-30     | 250 feet north                         | Winona Park 6A                             | 67  | 61                                 |
| I-10-31     | 250 feet north                         | Winona Park 6A                             | 67  | 61                                 |
| I-10-32     | 310 feet south                         | Winona Park 2                              | 69  | 61                                 |
| I-10-33     | 270 feet south                         | Deluxe Mobile Home Park                    | 67  | 61                                 |
| I-10-34     | 280 feet south                         | Deluxe Mobile Home Park                    | 66  | 61                                 |
| I-10-35     | 300 feet north                         | Franmar Manor                              | 68  | 61                                 |
| I-10-36     | 300 feet north                         | West View Manor                            | 72  | 61                                 |
| I-10-37     | 310 feet north                         | West View Manor                            | 71  | 61                                 |
| I-10-38     | 270 feet south                         | West Phoenix No. 4                         | 67  | 61                                 |
| I-10-39     | 220 feet south                         | West Phoenix No. 4                         | 72  | 62                                 |
| I-10-40     | 370 feet south                         | West Phoenix No. 4                         | 70  | 62                                 |
| I-10-41     | 340 feet north                         | Westcroft Place                            | 72  | 60                                 |
| I-10-42     | 250 feet north                         | Isaac Infill                               | 72  | 61                                 |
| I-10-43     | 360 feet north                         | Westcroft Place Plat 2                     | 65  | 60                                 |
| I-10-44     | 260 feet north                         | El Retiro Block 1 and 2                    | 70  | 62                                 |
| I-10-45     | 240 feet north                         | Sharon Gardens                             | 72  | 62                                 |
| I-10-46     | 370 feet south                         | Westcroft Place Plat 2                     | 67  | 62                                 |
| I-10-47     | 220 feet south                         | Westcroft Place Plat 2                     | 69  | 61                                 |
| I-10-48     | 330 feet south                         | El Retiro Block 1 and 2                    | 67  | 62                                 |
| I-10-49     | 280 feet south                         | North Willow Square                        | 71  | 62                                 |

| Receiver ID  | Distance and Direction from Centerline | Neighborhood or Area                                   | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|--|--|--|---|------------------------------------|
| I-10-50  | 370 feet south                         | North Willow Square                                    | 71  | 62                                 |
| I-10-51  | 370 feet south                         | North Willow Square Plat 2                             | 66  | 59                                 |
| W101 Alternative Western Option  |  |  |   |                                    |
| 55   | 410 feet east                          | Laveen Meadows   | 72  | 63                                 |
| 55d  | 545 feet east                          | Laveen Meadows Parcel 15                               | 71  | 63                                 |
| 57   | 820 feet west                          | 75th Avenue and Baseline Road                          | 68  | 63                                 |
| 57b  | 800 feet east                          | Laveen Ranch   | 69  | 63                                 |
| 57c  | 670 feet east                          | Laveen Ranch   | 70  | 59                                 |
| 71   | 2,270 feet west                        | Community <sup>g</sup> , 78th Avenue and Baseline Road | 61  | 60                                 |
| 72   | 945 feet east                          | 75th Avenue and Southern Avenue                        | 69  | 60                                 |
| 73   | 1,750 feet west                        | 95th Avenue and Broadway Road                          | 63  | 62                                 |
| 73a  | 535 feet east                          | 93rd Avenue and Broadway Road                          | 71  | 66 <sup>c</sup>                    |
| 73b  | 745 feet east                          | 89th Avenue and Broadway Road                          | 70  | 63                                 |
| 73c  | 450 feet east                          | 87th Avenue and Broadway Road                          | 73  | 62                                 |
| 73d  | 950 feet east                          | 84th Avenue and Broadway Road                          | 68  | 60                                 |
| 74   | 1,040 feet east                        | Tivoli   | 68  | 62                                 |
| 75   | 615 feet east                          | Country Place Parcel 26                                | 71  | 62                                 |
| 76   | 275 feet west                          | Country Place Parcel 25                                | 75  | 62                                 |
| 76a  | 925 feet west                          | 99th Avenue and Illini Street                          | 68  | 62                                 |
| 77   | 485 feet east                          | Country Place Parcel 22                                | 71  | 62                                 |
| 78   | 350 feet west                          | Country Place Parcel 21                                | 72  | 60                                 |
| 78a  | 1,080 feet west                        | Country Place Phase 4                                  | 66  | 61                                 |
| 78b  | 1,705 feet west                        | Country Place Phase 4                                  | 63  | 58                                 |
| 79   | 485 feet east                          | Country Place Parcel 23                                | 72  | 69 <sup>c</sup>                    |
| 80   | 445 feet east                          | Tolleson High School                                   | 73  | 63                                 |
| 80a  | 1,730 feet east                        | Tolleson-Goetz Tract, Block 100                        | 64  | 59                                 |
| 81   | 475 feet east                          | Concord Sundancer Apartments                           | 72  | 65 <sup>c</sup>                    |
| 82   | 1,090 feet east                        | Villa de Tolleson 1                                    | 66  | 60                                 |
| 82a  | 1,060 feet east                        | Parkview Casitas                                       | 64  | 59                                 |
| 82b  | 380 feet east                          | Sheely Farms Parcel 5                                  | 69  | 61                                 |
| 86   | 1,060 feet east                        | 75th and Southern avenues                              | 68  | 61                                 |
| 87   | 400 feet east                          | 75th and Southern avenues                              | 74  | 63                                 |
| Interstate 10 with W101 Alternative (Western, Central, and Eastern Options) <sup>h</sup> |  |  |   |                                    |
| I-10-1   | 1,350 feet north                       | Sheely Farms Parcel 3                                  | 63  | 63                                 |
| I-10-2   | 1,180 feet north                       | Apartments – McDowell Road and 93rd Avenue             | 62  | 62                                 |

(continued on next page)

Table 4-40 Noise Analysis Results, Western and Eastern Sections (continued)

| Receiver ID                     | Distance and Direction from Centerline | Neighborhood or Area                              | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|---------------------------------|--|---|---|------------------------------------|
| I-10-3                          | 510 feet south                         | Tolsun Farms                                      | 61  | 61                                 |
| I-10-4                          | 520 feet south                         | Tolsun Farms                                      | 67  | 61                                 |
| I-10-5                          | 1,440 feet north                       | Westpoint   | 69  | 63                                 |
| I-10-6                          | 470 feet north                         | EconoLodge  | 60  | 60                                 |
| I-10-7                          | 1,440 feet north                       | Amberlea Cottages                                 | 70  | 70 <sup>f</sup>                    |
| I-10-8                          | 460 feet north                         | Legacy Suites Apartments                          | 60  | 60                                 |
| I-10-9                          | 410 feet north                         | Daravante   | 63  | 58                                 |
| I-10-10                         | 380 feet north                         | Daravante   | 63  | 56                                 |
| I-10-11                         | 440 feet north                         | Hampton Square Apartments                         | 66  | 56                                 |
| I-10-12                         | 420 feet north                         | Hampton Square Apartments                         | 62  | 61                                 |
| I-10-13                         | 390 feet north                         | Sunpointe Apartments                              | 62  | 58                                 |
| I-10-14                         | 420 feet north                         | Las Gardenias Apartments                          | 63  | 58                                 |
| I-10-15                         | 460 feet north                         | Las Gardenias Apartments                          | 65  | 59                                 |
| I-10-16                         | 490 feet north                         | Westover Parc Condominiums                        | 62  | 60                                 |
| I-10-17                         | 440 feet north                         | Apartments – McDowell Road and 85th Avenue        | 61  | 58                                 |
| I-10-18                         | 420 feet north                         | Apartments – McDowell Road and 84th Avenue        | 61  | 58                                 |
| I-10-19                         | 410 feet north                         | Apartments – McDowell Road and 83rd Avenue        | 61  | 58                                 |
| I-10-20                         | 400 feet north                         | Avanti Apartments                                 | 61  | 57                                 |
| I-10-21                         | 500 feet north                         | Avanti Apartments                                 | 63  | 57                                 |
| I-10-22                         | 340 feet south                         | La Terraza  | 62  | 57                                 |
| I-10-23                         | 280 feet south                         | Patio Homes West                                  | 64  | 60                                 |
| I-10-24                         | 350 feet south                         | Patio Homes West                                  | 70  | 61                                 |
| I-10-W1                         | 1,280 feet north                       | Apartments – McDowell Road and 103rd Avenue       | 64  | 61                                 |
| I-10-W2                         | 1,270 feet north                       | Crystal Gardens Parcel 2A                         | 63  | 63                                 |
| I-10-W3                         | 1,400 feet north                       | Crystal Point                                     | 62  | 62                                 |
| I-10-W4                         | 670 feet south                         | Hotel   | 66  | 61                                 |
| I-10-W5                         | 960 feet north                         | Crystal Springs Apartments                        | 65  | 58                                 |
| I-10-W6                         | 980 feet north                         | Mobile Home Park – McDowell Road and 119th Avenue | 65  | 63                                 |
| I-10-W7                         | 810 feet south                         | Isolated homes – east of El Mirage Road           | 66  | 59                                 |
| I-10-W8                         | 1,040 feet north                       | Avondale Friendship Park                          | 63  | 63                                 |
| I-10-W9                         | 1,240 feet north                       | Avondale Friendship Park                          | 62  | 62                                 |
| I-10-W10                        | 1,070 feet north                       | Rio Santa Fe Apartments                           | 64  | 59                                 |
| I-10-W11                        | 350 feet south                         | Desert Sage Apartments                            | 71  | 62                                 |
| W101 Alternative Central Option |  |   |   |                                    |
| 83                              | 2,375 feet west                        | Union Elementary School                           | 60  | 55                                 |

| Receiver ID                     | Distance and Direction from Centerline | Neighborhood or Area               | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|---------------------------------|--|------------------------------------|---|------------------------------------|
| 83a                             | 1,750 feet west                        | 89th Avenue and Broadway Road      | 62  | 58                                 |
| 83b                             | 1,200 feet west                        | 89th Avenue and Broadway Road      | 65  | 60                                 |
| 83c                             | 330 feet west                          | Hurley Ranch Parcel 3              | 75  | 63                                 |
| 83d                             | 445 feet west                          | Hurley Ranch Parcels 1 and 2       | 71  | 63                                 |
| 84                              | 765 feet east                          | Volterra                           | 70  | 62                                 |
| 84a                             | 750 feet east                          | Volterra                           | 68  | 63                                 |
| 85                              | 835 feet east                          | Ryland at Heritage Point           | 68  | 63                                 |
| 85a                             | 595 feet west                          | Farmington Park                    | 71  | 67 <sup>c</sup>                    |
| 85b                             | 550 feet west                          | Farmington Park                    | 70  | 61                                 |
| 85c                             | 295 feet west                          | Farmington Park                    | 73  | 62                                 |
| 89a                             | 580 feet east                          | 84th Avenue and Broadway Road      | 71  | 62                                 |
| 89b                             | 1,805 feet east                        | 83rd Avenue north of Broadway Road | 63  | 58                                 |
| 100                             | 1,240 feet east                        | Ryland at Heritage Point           | 65  | 60                                 |
| W101 Alternative Eastern Option |  |                                    |   |                                    |
| 72                              | 930 feet east                          | 75th and Southern avenues          | 69  | 61                                 |
| 80                              | 490 feet east                          | Tolleson High School               | 72  | 63                                 |
| 80a                             | 1,395 feet east                        | Tolleson-Goetz Tract Block 100     | 65  | 61                                 |
| 84a                             | 650 feet west                          | Volterra                           | 69  | 59                                 |
| 86                              | 1,060 feet east                        | 75th and Southern avenues          | 68  | 61                                 |
| 87                              | 400 feet east                          | 75th and Southern avenues          | 73  | 63                                 |
| 88                              | 1,920 feet east                        | Estrella Village Manor             | 62  | 59                                 |
| 88a                             | 625 feet east                          | Tuscano Phase 2 Parcel C           | 70  | 63                                 |
| 88b                             | 410 feet east                          | Tuscano Phase 2 Parcel A           | 71  | 60                                 |
| 89                              | 1,205 feet west                        | 83rd Avenue and Mobile Street      | 66  | 60                                 |
| 89a                             | 1,460 feet west                        | 84th Avenue and Broadway Road      | 64  | 61                                 |
| 89b                             | 550 feet west                          | 83rd Avenue north of Broadway Road | 71  | 62                                 |
| 89c                             | 400 feet west                          | 83rd Avenue north of Broadway Road | 71  | 61                                 |
| 90                              | 300 feet west                          | Volterra                           | 72  | 62                                 |
| 91                              | 370 feet east                          | Volterra                           | 71  | 62                                 |
| 92                              | 520 feet east                          | Tuscano Phase 1                    | 69  | 60                                 |
| 93                              | 400 feet east                          | Volterra                           | 72  | 61                                 |
| 94                              | 325 feet west                          | Volterra                           | 72  | 61                                 |
| 95                              | 580 feet east                          | Volterra                           | 70  | 64 <sup>c</sup>                    |
| 96                              | 840 feet east                          | Ryland at Heritage Point           | 69  | 64 <sup>c</sup>                    |
| 97                              | 690 feet east                          | Ryland at Heritage Point           | 70  | 59                                 |

(continued on next page)



Table 4-40 Noise Analysis Results, Western and Eastern Sections (continued)

| Receiver ID                | Distance and Direction from Centerline | Neighborhood or Area                     | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|----------------------------|--|--|---|------------------------------------|
| 98                         | 520 feet west                          | Farmington Park                          | 71  | 63                                 |
| 98a                        | 330 feet west                          | Farmington Park                          | 74  | 62                                 |
| 99                         | 305 feet west                          | Farmington Park                          | 73  | 64 <sup>c</sup>                    |
| 100                        | 950 feet east                          | Ryland at Heritage Point                 | 67  | 60                                 |
| 100a                       | 450 feet east                          | School at 87th Avenue and Durango Street | 73  | 63                                 |
| Eastern Section            |  |  |   |                                    |
| E1 (Preferred) Alternative |  |  |   |                                    |
| 1                          | 250 feet north                         | Foothills Paseo 2                        | 75  | 63                                 |
| 1a                         | 460 feet south                         | Pecos Park                               | 73  | 61                                 |
| 1b                         | 320 feet south                         | Pecos Park                               | 75  | 62                                 |
| 1c                         | 440 feet south                         | Pecos Park                               | 73  | 60                                 |
| 2                          | 260 feet north                         | Foothills Paseo 2                        | 76  | 62                                 |
| 3                          | 335 feet north                         | Foothills Paseo 2                        | 72  | 61                                 |
| 4                          | 785 feet north                         | Wilton Commons                           | 68  | 62                                 |
| 5                          | 235 feet north                         | Kyrene de los Lagos Elementary School    | 76  | 63                                 |
| 6                          | 220 feet north                         | Lakewood Parcel 20                       | 74  | 63                                 |
| 7                          | 215 feet north                         | Lakepoint 21 at Lakewood                 | 75  | 63                                 |
| 8                          | 380 feet north                         | Kyrene Akimel Middle School              | 74  | 61                                 |
| 9                          | 390 feet north                         | Foothills Mountain Ranch 2               | 70  | 63                                 |
| 10                         | 280 feet north                         | Foothills Apartments                     | 72  | 62                                 |
| 11                         | 320 feet north                         | Foothills Parcel 5B                      | 74  | 62                                 |
| 12                         | 325 feet north                         | Foothills Parcel 5A                      | 74  | 62                                 |
| 13                         | 305 feet north                         | Foothills Parcel 5C                      | 75  | 62                                 |
| 14                         | 290 feet north                         | Parcel 6A at the Foothills               | 75  | 62                                 |
| 15                         | 370 feet north                         | Parcel 6A at the Foothills               | 73  | 67 <sup>c</sup>                    |

<sup>a</sup> in decibels (dBA), which are logarithmic units that express the ratio of the sound pressure level being measured to a standard reference level and is frequency-weighted using the A-scale, to approximate the frequency response of the human ear

<sup>b</sup> Sites 1 to 35 are located in the Eastern Section and are presented later in the table.

<sup>c</sup> Further mitigation would require a noise barrier taller than 20 feet, which would not meet the Arizona Department of Transportation Noise Abatement Policy.

<sup>d</sup> Numerous new receivers were added to represent new development since the initial analysis began in 2003. These receivers are designated with a letter following the receiver number to maintain the sequential numbering system.

<sup>e</sup> Traffic noise from nearby cross street prevented further noise reduction at this receiver.

| Receiver ID | Distance and Direction from Centerline | Neighborhood or Area                              | Unmitigated Action Alternative Noise Level <sup>a</sup> | Mitigated Noise Level <sup>a</sup> |
|-------------|--|---|---|------------------------------------|
| 16          | 400 feet north                         | Foothills Parcels 12A, B, C                       | 73  | 69 <sup>d</sup>                    |
| 17          | 690 feet north                         | Foothills Parcels 12A, B, C                       | 70  | 62                                 |
| 18          | 405 feet north                         | Fairway Hills at Club West                        | 73  | 62                                 |
| 19          | 455 feet north                         | Fairway Hills at Club West                        | 72  | 61                                 |
| 20          | 460 feet north                         | Parcel 9G at Foothills Club West                  | 72  | 61                                 |
| 21          | 350 feet north                         | Parcels 18A, 19D, 19E, 26B at Foothills Club West | 74  | 62                                 |
| 21a         | 395 feet north                         | Parcels 18A, 19D, 19E, 26B at Foothills Club West | 73  | 61                                 |
| 22          | 1,175 feet north                       | Parcel 26 at Foothills Club West                  | 65  | 61                                 |
| 22a         | 470 feet north                         | Foothills Club West Parcels 20 and 25 Amended     | 71  | 64 <sup>c</sup>                    |
| 23          | 1,370 feet north                       | Parcel 23 at Foothills Club West                  | 64  | 60                                 |
| 24          | 210 feet north                         | Foothills Reserve Parcel D                        | 77  | 63                                 |
| 24a         | 865 feet north                         | Foothills Reserve                                 | 67  | 60                                 |
| 24b         | 1,400 feet north                       | Foothills Reserve                                 | 69  | 61                                 |
| 25          | 195 feet north                         | Foothills Reserve Parcel D                        | 76  | 62                                 |
| 26          | 240 feet north                         | Foothills Reserve Parcel C                        | 76  | 62                                 |
| 26a         | 350 feet north                         | Foothills 80                                      | 75  | 63                                 |
| 27          | 470 feet east                          | Dusty Lane area                                   | 72  | 61                                 |
| 28          | 490 feet east                          | Dusty Lane area                                   | 72  | 61                                 |
| 29          | 335 feet east                          | Dusty Lane area                                   | 74  | 62                                 |
| 30          | 760 feet west                          | Community Casino                                  | 67  | 67 <sup>f</sup>                    |
| 31          | 580 feet east                          | Dusty Lane area                                   | 69  | 60                                 |
| 32          | 1,540 feet west                        | Community, 51st Avenue area                       | 63  | 59                                 |
| 33          | 420 feet east                          | Dusty Lane area                                   | 74  | 68 <sup>c</sup>                    |
| 34          | 760 feet west                          | Community, 51st Avenue area                       | 67  | 62                                 |
| 35          | 670 feet east                          | 53rd Avenue and Estrella Drive                    | 68  | 62                                 |
| 35a         | 770 feet east                          | Tierra Montana Phase 1                            | 69  | 62                                 |

<sup>f</sup> mitigation typically not recommended for hotels, motels, and casinos

<sup>g</sup> Gila River Indian Community

<sup>h</sup> The noise analysis results along Interstate 10 are the same for all of the W101 Alternative Options.

<sup>i</sup> not eligible for mitigation based on land use category

Construction Noise

Short-term noise impacts may be experienced during construction along any of the various action alternatives. Quantification of such impacts is difficult without data on the proposed freeway’s construction schedule and equipment to be used. Therefore, several assumptions were made to project the approximate noise level at R/W boundaries. These projections are based on the use of the noisiest equipment expected during each construction stage of a typical roadway project (State Route 202L [Red Mountain Freeway] near Mesa Drive). Data on construction equipment noise are available from *FHWA Highway Construction Noise Handbook* (FHWA 2006).

Measurements were taken during a freeway construction project in Arizona (SR 202L [Red Mountain Freeway] near Mesa Drive) that assessed the collective impact of construction noise. The maximum noise levels ( $L_{max}$ ) were calculated at the R/W line. The distance between the R/W and the construction activity was estimated based on the type of work being performed.

Results of the preliminary estimates, shown below, indicate that sensitive receivers could be adversely affected by construction noise if the receivers were immediately adjacent to the proposed R/W. The highest noise levels would occur during the grading/earthwork phase of the construction project.

Construction Equipment Noise

| Phase             | Equipment       | Equipment ( $L_{max}$ ) <sup>a</sup> | Feet to R/W <sup>b</sup> | $L_{max}$ at R/W |
|-------------------|-----------------|--------------------------------------|--------------------------|------------------|
| Site clearing     | Dozer/Backhoe   | 82/78                                | 50                       | 83               |
| Grading/Earthwork | Scraper/Grader  | 84/85                                | 75                       | 85               |
| Foundation        | Backhoe/Loader  | 78/79                                | 100                      | 78               |
| Base preparation  | Compactor/Dozer | 83/82                                | 100                      | 82               |

<sup>a</sup> maximum noise level, measured in dBA (a logarithmic unit that expresses the ratio of the sound pressure level being measured to a standard reference level and is frequency-weighted using the A-scale, to approximate the frequency response of the human ear)

<sup>b</sup> right-of-way

mitigation strategies that could be applied in addition to or instead of standard noise walls or earth berms are discussed later in this section.

Where the main line would be elevated, each of the noise barriers would be placed on the freeway embankment, near the edge of the shoulder, to take advantage of the elevated profile. (Placing a noise barrier on an elevated section of freeway results in a lower wall height to achieve the same noise reduction.) Where feasible (but not likely in the areas where the main line would be elevated), noise barriers would be constructed as early as possible in the construction phasing to shield adjacent properties from construction-related noise impacts.

In addition, the ADOT NAP specifies that the noise reduction design goal for benefited receivers closest to a transportation facility is 7 dBA; however, a noise reduction of only 5 dBA is required for a receiver to be considered “benefited” by the mitigation. Mitigation should result in a noise level below the NAC approach level. Also, the ADOT NAP specifies that the maximum reasonable barrier height is 20 feet.

For some of the receivers along the action alternatives, a barrier as high as 20 feet would provide more than 5 dBA of noise reduction, but a noise level below 64 dBA could not be achieved. According to ADOT policy, barriers generally will not be constructed higher than 20 feet because of structural and wind load considerations. Therefore, no further noise reduction would be provided.

Action Alternatives, Western Section

W59 (Preferred) Alternative

Nineteen new barriers and one raised barrier would be needed to reduce noise levels in accordance with the ADOT NAP along the W59 Alternative and I-10 (Papago Freeway). The barriers would range in height from 10 to 20 feet and would reduce noise levels at the 84 receivers to between 58 dBA  $L_{eq}$  and 72 dBA  $L_{eq}$ . The noise level at three of the receivers (R54c, R54d, and R54e) would not be reduced in full accordance with the ADOT NAP because of noise impacts from adjacent arterial streets. These receivers would achieve noise reductions of 1 dBA to 3 dBA but would still have noise levels higher than 64 dBA. The barriers would total approximately 751,900 square feet in area. Using the standard \$35 per square foot of barrier recommended by ADOT, the cost of noise mitigation for the W59 Alternative would be approximately \$26.3 million.

W71 Alternative

Eighteen new barriers and one raised barrier would be needed to reduce noise levels in accordance with the ADOT NAP along the W71 Alternative and I-10 (Papago Freeway). The barriers would range in height from 10 to 20 feet and would reduce noise levels at the 80 receivers to between 58 dBA  $L_{eq}$  and 66 dBA  $L_{eq}$ . The noise level at seven of the receivers (R55, R55a, R55c, R56, R62, R67, and R69), even with a 20 foot high noise barrier, would not be reduced to less than the approach threshold of 64 dBA, which is ADOT’s goal for reducing traffic noise on new roadway projects. All of these receivers (with the exception of R69), however, would experience at least a 5 dBA reduction in the projected noise level. The reduction at R69 is predicted to be 4 dBA. The barriers would total approximately 1,045,100 square feet in area. Using the standard \$35 per square foot recommended by ADOT, the cost of noise mitigation for the W71 Alternative would be approximately \$36.6 million.



W101 Alternatives and Options

- Seventeen new barriers would be needed to reduce noise levels in accordance with the ADOT NAP along the W101 Alternative Western Option. The barriers would range in height from 10 to 20 feet and would reduce noise levels at the 29 receivers to between 58 dBA  $L_{eq}$  and 69 dBA  $L_{eq}$ . The noise level at three of the receivers (R73a, R79, and R81), even with a 20 foot high noise barrier, would not be reduced to less than the approach threshold of 64 dBA. Receivers R73a and R81 would experience at least a 5 dBA reduction in the projected noise level. Noise level reductions at R79 are predicted to be only 3 dBA. The barriers would total approximately 841,000 square feet in area. Using the standard \$35 per square foot recommended by ADOT, the cost of noise mitigation for the W101 Alternative Western Option would be approximately \$29.4 million.
- Twenty new barriers would be needed to reduce noise levels in accordance with the ADOT NAP along the W101 Alternative Central Option. The barriers would range in height from 10 to 20 feet and would reduce noise levels at the 14 receivers to between 55 dBA  $L_{eq}$  and 67 dBA  $L_{eq}$ . The noise level at one of the receivers (R85a) would not be reduced in full accordance with the ADOT NAP because of noise impacts from adjacent arterial streets; it would experience only a 4 dBA reduction in the projected noise level. The barriers would total approximately 841,500 square feet in area. Using the standard \$35 per square foot recommended by ADOT, the cost of noise mitigation for the W101 Alternative Central Option would be approximately \$29.5 million.
- Sixteen new barriers would be needed to reduce noise levels in accordance with the ADOT NAP along the W101 Alternative Eastern Option. The barriers would range in height from 10 to 20 feet and would reduce noise levels at the 26 receivers to between 59 dBA  $L_{eq}$  and 64 dBA  $L_{eq}$ . The noise level at one of the receivers (R89a) would not be reduced in full accordance with the ADOT NAP because of noise impacts from adjacent arterial streets. Noise levels at

this receiver would be reduced to below 64 dBA, but would achieve a noise reduction of only 3 dBA. The noise level at three of the receivers (R95, R96, and R99), even with a 20 foot high noise barrier, would not be reduced to less than the approach threshold of 64 dBA. These receivers, however, would experience at least a 5 dBA reduction in the projected noise level. The barriers would total approximately 872,800 square feet in area. Using the standard \$35 per square foot recommended by ADOT, the cost of noise mitigation for the W101 Alternative Eastern Option would be approximately \$30.5 million.

- For the W101 Alternative and Options along I-10 (Papago Freeway), two new barriers would be needed to reduce noise levels in accordance with the ADOT NAP. The barriers would range in height from 10 to 15 feet and would reduce noise levels at two receivers (I10-W4 and I10-W7) to between 59 dBA  $L_{eq}$  and 61 dBA  $L_{eq}$ . The barriers would total approximately 53,100 square feet in area. Using the standard \$35 per square foot recommended by ADOT, the cost of noise mitigation for the W101 Alternative and Options along I-10 would be approximately \$1.9 million.

Action Alternative, Eastern Section  
E1 (Preferred) Alternative

Twenty new barriers would be needed to reduce noise levels in accordance with the ADOT NAP along the E1 Alternative. The barriers would range in height from 8 to 20 feet and would reduce noise levels at the 44 receivers to between 59 dBA  $L_{eq}$  and 69 dBA  $L_{eq}$ . The noise levels at four of the receivers (R15, R16, R22a, and R33) would not be reduced in full accordance with the ADOT NAP even with a 20 foot-high noise barrier. With the exception of R16, each of these receivers, however, would experience at least a 5 dBA reduction in projected noise levels. The noise level reduction at R16 is predicted to be only 4 dBA. Additionally, the noise level at R16 would not be reduced in full accordance with the ADOT NAP because of noise impacts from adjacent

arterial streets. The barriers would total approximately 1,356,200 square feet in area. Using the standard \$35 per square foot recommended by ADOT, the cost of noise mitigation for the E1 Alternative would be approximately \$47.5 million.

No-Action Alternative

The No-Action Alternative assumes that the proposed action would not be selected. Consequently, under the No-Action Alternative, noise mitigation would not be provided for any of the receivers.

OTHER POSSIBLE MITIGATION STRATEGIES

A number of mitigation strategies are available that could be used instead of, or in addition to, noise barriers. These involve elements of the action alternatives' alignments, design features, and restrictions.

- Depressing the freeway** – For most alignments of each of the action alternatives, the proposed freeway would be elevated above the natural grade of the surrounding land. This elevated profile would allow noise to carry farther, creating noise impacts at greater distances from the freeway. Depressing the profile of the freeway below grade (see *Depressed Freeway Options*, on page 3-15) may result in reduced traffic noise levels adjacent to depressed sections (FHWA 1980). However, it would be necessary to also construct at-grade noise barriers to achieve noise reduction goals at receiver locations adjacent to depressed freeway sections. This strategy would also reduce the visual impacts associated with high noise walls on elevated freeways (FHWA 1994). A major disadvantage of this strategy, however, would be the added substantial construction cost of depressing the freeway, including possible acquisition of R/W and provision of drainage (pumping systems and retention basins).
- Rubberized asphalt pavement surface** – Until recently, new freeways constructed by ADOT were composed of concrete pavement. ADOT has embarked on a multiyear pilot program in

Noise policy as it applies to the proposed action

According to ADOT policy, noise mitigation should achieve a reduction of 5 to 7 dBA and result in a noise level of less than 64 dBA for residential and similar areas (Type B and C land use categories) (ADOT 2011b). Some of the receivers along the proposed action alternatives would be affected by noise from adjacent surface streets in addition to that from the proposed freeway. For some of these receivers, the proposed noise barriers would achieve a 5 dBA reduction, but the mitigated noise level would remain above the 64 dBA NAC approach level. For many of these receivers, however, the proposed noise barriers would achieve only a 3 to 4 dBA reduction, because the dominant noise source at the receiver would be the local arterial street rather than the proposed freeway. It would not be feasible to achieve additional noise reduction because of the impact from the local streets. Noise barriers would need to be constructed outside of the proposed R/W of the action alternatives to effectively reduce noise levels from local streets at these receivers. It would not be feasible to construct noise barriers outside of the proposed R/W. Each of these receivers would achieve the ADOT NAP criterion when modeled without the local street traffic.

**Rubberized asphalt pavement pilot program**

In 2003, ADOT and FHWA started a pilot program to study the noise reduction potential of rubberized asphalt pavement overlays. The goal of the rubberized asphalt overlay program is to reduce traffic noise levels from freeways by 4 dBA. Initial noise measurements completed for the pilot study indicate the traffic noise reduction goal of 4 dBA for rubberized asphalt pavement is realistic; however, mitigation credit cannot be taken for potential noise reductions.

cooperation with FHWA to overlay the metropolitan Phoenix freeway system with a rubberized asphalt pavement surface. The rubberized asphalt paving program seeks to reduce freeway traffic noise levels by at least 4 dBA. At this point in the pilot study, such results appear to be achievable. ADOT would overlay the proposed action’s concrete pavement with rubberized asphalt, but is not making any predictions at this time regarding expected noise reductions. Noise modeling during the final design phase would reflect the most current FHWA modeling criteria, which may include rubberized asphalt.

- **Truck traffic restrictions or reduced posted speed limits** – Discussions regarding reduction of transportation noise impacts have at times focused on restricting truck traffic entirely or during certain hours of the day and on reducing the posted speed limit of a transportation facility. Reducing weight limits is another potential noise reduction strategy. In theory, all of these strategies would reduce the noise impacts on adjacent properties because trucks produce higher noise levels than automobiles and higher speeds generate more noise than lower speeds (FHWA 1976). None of these strategies would, however, be consistent with the purpose and need for the proposed action and, therefore, are not feasible for the proposed freeway.

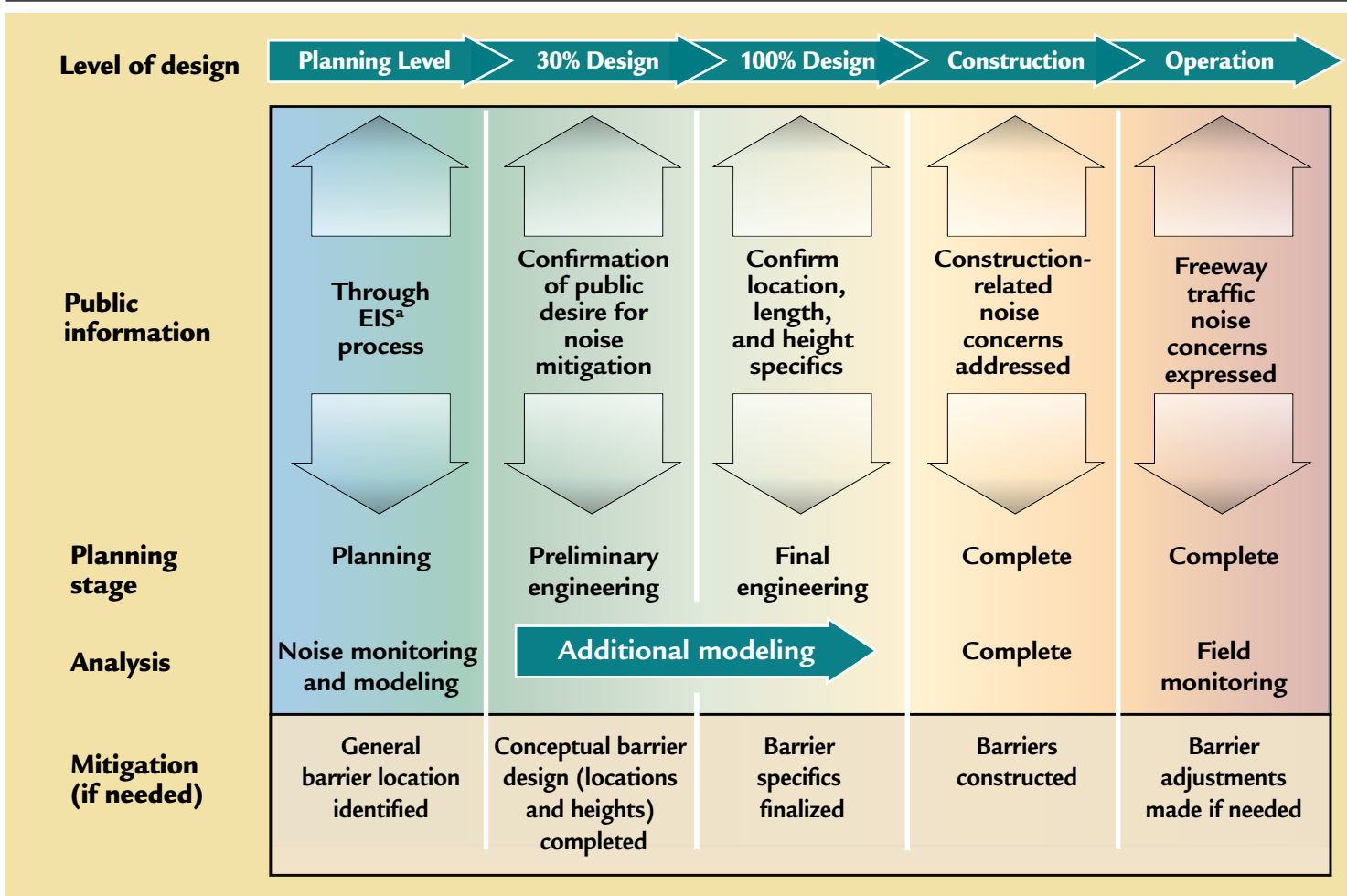
**CONCLUSIONS**

Implementation of the proposed action would introduce traffic noise where it currently does not exist or at higher levels than now experienced. There are sensitive receivers [e.g., residences, Section 4(f) resources, schools, parks, churches] where freeway noise might be perceived adversely by users of such facilities. The exact number of receivers eligible for noise mitigation would depend on which action alternatives might be implemented and would be determined during refinements of the noise analysis during later phases of design. The combinations of the W59/E1 (Preferred) Alternative and W71/E1 Alternative would likely have the most affected eligible receivers, followed by the W101/E1 Alternative.

Impacts are expected for a project of this magnitude located in a rapidly growing region. With the placement of noise barriers in selected locations along the selected action alternatives—if any—freeway noise would be reduced to levels that would meet ADOT policy and FHWA regulations for abatement where possible. Under the No-Action Alternative, travel speeds would generally be reduced (along with noise levels) because of increased

congestion near modeled receivers, but noise levels would increase in other areas, such as along arterial streets. ADOT would continue to encourage the public’s involvement in freeway-related noise issues through final design, construction, and operation of the proposed action (see Figure 4-30).

**Figure 4-30** Noise Barrier Process



<sup>a</sup> environmental impact statement

*The determination of the location, length, and height of noise barriers requires multiple stages of modeling analysis and offers the public a number of opportunities to gather information and provide comments.*